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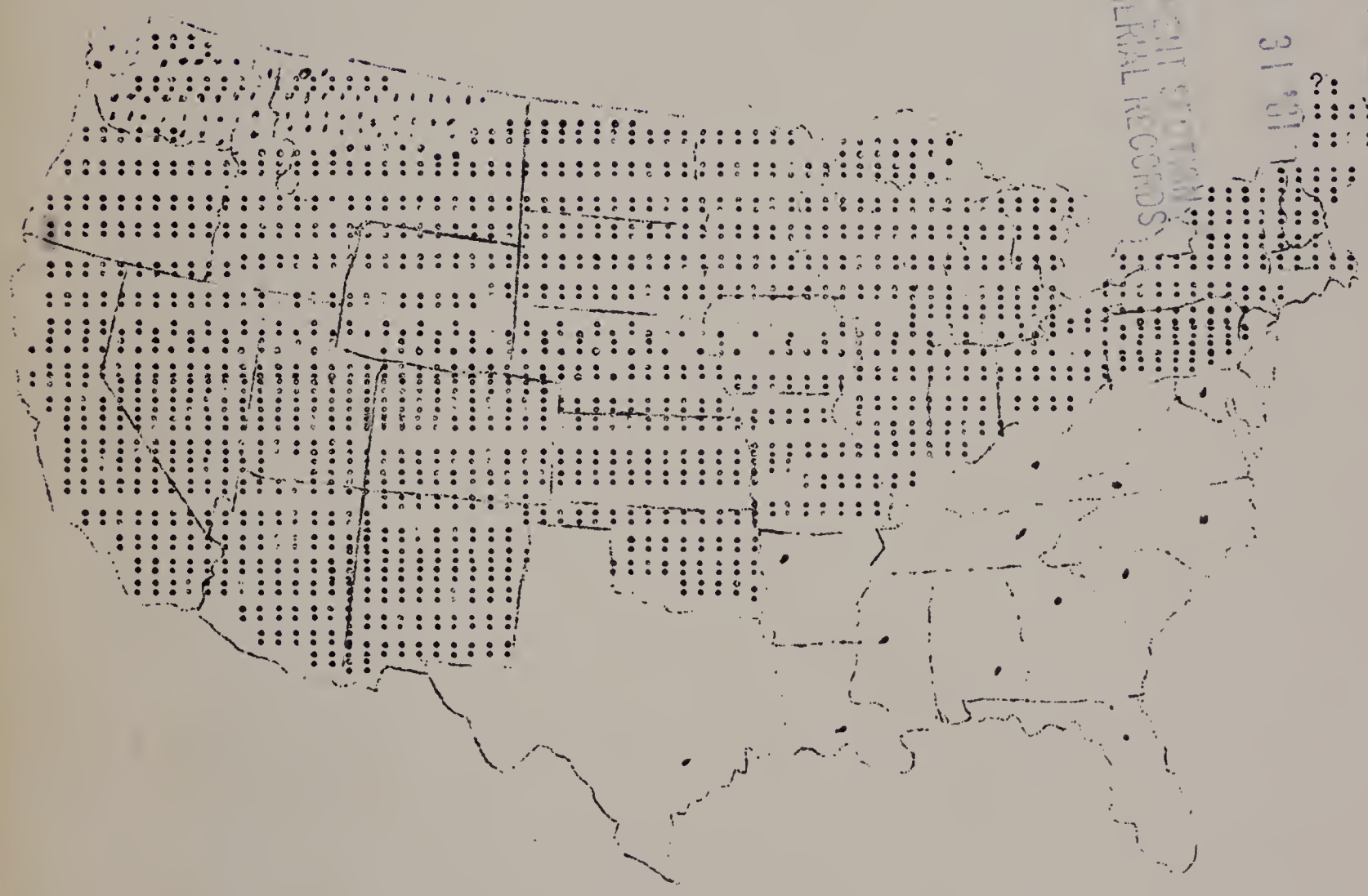
U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HUSBANDRY RESEARCH DIVISION
AND
COOPERATING SOUTHERN STATES

# 1957 Annual Report of S-10 IMPROVEMENT OF BEEF CATTLE FOR THE SOUTHERN REGION THROUGH BREEDING METHODS

January 1, 1958





This is a report of project leaders and the Regional Coordinator covering research projects not yet completed. It is intended for the use of administrative leaders and workers in this or related fields of research. The material is not intended for general distribution and should not be quoted in publications.

C O N T E N T S


| | Page |
|---|---|
| Introduction | 1 |
| Personnel | 3 |
| State Reports: | |
| Alabama | 11 |
| Arkansas | 17 |
| Florida | 22 |
| Georgia | 30 |
| Kentucky | 35 |
| Louisiana | 38 |
| Maryland | 46 |
| Mississippi | 53 |
| North Carolina | 57 |
| South Carolina | 66 |
| Tennessee | 68 |
| Texas | 78 |
| Virginia | 96 |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# PERSONNEL OF THE S-10 PROJECT

## STATE AGRICULTURAL EXPERIMENT STATION WORKERS
(asterick indicates Technical Committee Members for 1958)

| | | |
|---|---|---|
| Alabama | *W. M. Warren, T. B. Patterson | Auburn, Ala. |
| Arkansas | *Warren Gifford, C. J. Brown | Fayetteville, Ark. |
| Florida | *Marvin Koger, A. C. Warnick | Gainesville, Fla. |
| | W. G. Kirk | Ona, Fla. |
| Georgia | *B. L. Southwell, W. C. McCormick | Tifton , Ga. |
| | T. M. Clyburn | Reidsville, Ga. |
| Kentucky | *A. R. Parsons, D. G. Steele | Lexington, Ky. |
| Louisiana | *Richard A. Damon, Jr. | Baton Rouge, La. |
| Maryland | *W. W. Green, J. E. Foster | College Park, Md. |
| Mississippi | *C. E. Lindley, J. C. Taylor | State College,Miss. |
| | B. G. Ruffin | Prairie,Miss. |
| North Carolina | *E. U. Dillard, E. R. Barrick, J. H. Gregory L. Goode, F. E. Boss | Raleigh,N. C. |
| South Carolina | *E. G. Godbey, W. C. Godley | Clemson,S. C. |
| Tennessee | *C. S. Hobbs, H. J. Smith, J. W. High, Ralph Dodson | Knoxville, Tenn. |
| | J. M. Bird, R. A. Reynolds | Oak Ridge, Tenn. |
| | J. H. Felts | Greeneville, Tenn. |
| | J. A. Odom | Crossville, Tenn. |
| | L. L. Safley | Springfield, Tenn. |
| | E. J. Chapman, J. McLaren | Spring Hill, Tenn. |
| | R. Moorman, J. Bryan, R. Scott | Grand Junction, Tenn. |
| Texas | *T. C. Cartwright | McGregor, Tex. |
| | R. E. Patterson, Sylvia Cover, O. D. Butler H. O. Kunkel | College Station, Tex. |
| | A. A. Melton | Balmorhea, Tex. |
| | J. P. Smith, George Ellis | Panhandle, Tex. |
| Virginia | *G. W. Litton, R. C. Carter, T. J. Marlowe, J. A. Gaines, J. S. Copenhaver | Blacksburg, Va. |
| | K. P. Bovard | Front Royal, Va. |
| | Roy Hammes | Middleburg, Va. |
| | William McClure | Steeles Tavern, Va. |

## U. S. DEPARTMENT OF AGRICULTURE WORKERS

E. J. Warwick, Acting Chief, Cattle Research Section ..... Beltsville, Md.
C. M. Kincaid, Regional Coordinator, S-10 ..... Knoxville, Tenn.
E. H. Vernon, Supt, Iberia Livestock Experiment Farm ..... Jeanerette, La.
B. M. Priode, Supt., Beef Cattle Research Station ..... Front Royal, Va.
W. C. Burns, Acting Supt., West Central Fla. Exp. Sta. ... Brooksville, Fla.

## REGIONAL OFFICERS - 1958

R. E. Patterson, Administrative Adviser ..... College Station, Texas
Warren Gifford, Chairman ..... Fayetteville, Arkansas
W. W. Green, Secretary ..... College Park, Maryland
T. C. Cartwright, Executive Committee Member ..... McGregor, Texas

## INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the south. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Earlier reports have included material on the overall program and will not be repeated here. A limited number of these earlier reports for each year are available and may be obtained from the Regional Coordinator.

The state reports in this publication were prepared by station project leaders and personnel as summaries of research developments and progress at each station during 1957. The results are not considered as final but the information presented will aid cooperators and the coordinator in developing an integrated program. This material also provides information needed by Animal Husbandry department heads, station directors and U. S. Department of Agriculture officials. These data are not intended for general distribution and should not be quoted in publications.

## SCOPE OF PROJECT AND DEVELOPMENTS DURING 1957

As of July 1, 1957, there were 11,091 cattle at stations in the program. This cattle inventory included 5353 cows and heifers over two-years of age, 1296 yearling heifers, 3567 calves under one-year of age, 405 bulls and 470 steers. Performance feeding and/or grazing tests were completed during the year on 934 young bulls, 828 heifers and 475 steers. As compared with July 1, 1956, the numbers of breeding cattle had increased by 10% and the number performance tested by 36%. For the region as a whole, numbers of breeding cattle are approaching the capacity of present land and facilities available for beef cattle at most locations.

Emphasis has continued on the development of more precise methods for beef cattle improvement with respect to performance characteristics such as growth rate, efficiency, cow productivity, adaptation to environmental conditions and quality of meat. The latter characteristic has received increased attention through cooperative investigations between beef cattle breeding and meats investigations at several institutions. Finished animals produced in the breeding program have provided experimental material of known and often diverse genetic and environmental background for exploratory study of factors which may influence eating quality of beef.

Pregnancy examinations were made at several stations to identify and eliminate barren cows soon after the close of the breeding season. This avoided wintering cows that would not calve and increased the effective number of breeding cows in relation to facilities available.

Experimental cattle were maintained at 32 experiment stations and substations in the area. Of these, 29 are state-owned and 3 Federally-owned. The latter three stations at Jeanerette, Louisiana; Brooksville, Florida; and Front Royal, Virginia, are in each case, operated cooperatively with the state in which the station is located.

## Matings In Project Diversified

Investigation of the beef making potential of many different types and kinds of cattle was continued. In all, some 38 different types of matings were represented in the 1957 calf crop. Of these, 11 were from "inter se" matings within herds belonging either to breeds with established purebred record associations or strains derived from crosses among British and Zebu type cattle. The other 27 types of matings were crosses of various kinds among and between three British breeds, Brahman, British-Brahman strains and Charolaise. The approximate percentage in each main type of mating was: British beef breeds "inter se" 65%; Brahman and British-Zebu derivities "inter se" 15%; crosses among British breeds 4%; and all other types of crosses 16%.

## Research Results of the Year

The state reports show accomplishments at each station more or less in detail. Statements which follow summarize some of the more important findings with general application to the region.

### a. Growth Potential Linear to 18-months of Age.

As postweaning information accumulates, it becomes increasingly clear that potential for continuous growth under optimum conditions is more or less constant from about 3 to 18-months of age. In general, calves that gain as much as 2¼ pounds per day or more to weaning or to the beginning of gain evaluation tests, show somewhat the same gains on test. On the other hand, calves with gains of 1 3/4 pounds per day or less, prior to test, often range from pre-test gain to over 3 pounds per day. The fastest gainers on test from this latter group may show higher test gains than those in the first group. In general, calves with heaviest weight for age at the end of feeding tests were those that were also heaviest for their age at weaning, or at the beginning of the test. With the accumulation of data on pre-and postweaning gains over the region, it is believed that methods can be developed for more precise estimates of growth potential from performance based on all periods of development up to 18-months of age.

### b. Reproductive Performance of Cows Influenced by Age, Lactation Status and Genetic Background.

Preliminary analysis of data obtained in a survey of breeding cows in S-10 herds over a 5-year period indicated three important factors influenced the percentage calf crop raised. Of 13,594 cows bred or exposed to bulls, 78% calved and 71% raised calves to weaning. In general, the percentage calf crop increased as age increased from 1 to 4 years of age when bred. Conception rates tended to be lower for the younger cows but the big difference between them and the mature cows was in percentage of calves raised, particularly for the yearlings when bred. Calf mortality at birth amounted to 12% for yearlings; 8% for 2-year olds; 5% for 3-year olds and 4% for 4-year olds and over. Calf mortality from birth to weaning was about 3% and showed no definite pattern with respect to age or breed. Comparison of lactating and dry cows when bred, showed an interaction of lactation status with genetic background. For British type cows, those suckling calves, showed

11% higher conception rates than dry cows while Zebu and Zebu-cross cows showed a 14% difference in favor of the dry cows.

c. Repeatability of Cow Performance Based on Weaning Weight of Calves Estimated at about 1/3.

Analysis of data for estimates of repeatability of cow performance based on weaning weights and grades at the Tennessee and Virginia stations were in general agreement and in the neighborhood of 1/3. In the Virginia data, cow repeatability for grade and weight at 120-days and at weaning were essentially the same. This suggests that mothering ability of the dam may be measured almost as well from the first half of the suckling period as from the entire suckling period.

d. Correction Factors for Weaning Weight Revised at Two Stations.

Studies of data on weaning weight and grade at the Tennessee and Virginia stations indicated that age of dam, sex of calf and season of birth were important factors influencing weaning weight and to a slight extent, grade. Both studies were in close agreement and showed that weaning weight increased as age of dam at calving increased from 2 to 5 years of age, with those from 6 to 10 years of age averaging essentially the same. Calf weights tended to decrease as the age of dam increased above 10 years of age. The average adjustments needed for the two stations to correct to mature equivalent for age of dam were 1.18, 1.10, 1.06 and 1.03 for 2, 3, 4 and 5-year old dams, respectively. Bull calves gained about 10% faster than heifer calves and spring-born calves about 6% faster than fall-born calves.

e. Sire May Influence Mothering Ability of His Daughters.

Comparison of the weaning weights of calves from daughters of several different sires at the Tennessee station suggested that the sire may have a marked influence on the mothering ability of his daughters. The numbers were small but the data suggest that the productivity of dams of bull calves should be considered in their selection for use as sires. It appears that sires which transmit low mothering ability may effectively reduce weaning weights of calves.

f. Selecting Fast Gaining Sires Increases Growth Rate in Calves.

Progeny tests of fast, intermediate and slow gaining sires at the Texas station further confirm similar work at this and other stations. Differences in gain showed up at weaning as well as at the end of postweaning feed tests for both steers and heifers. Differences in average weaning weight and in postweaning weights were essentially linear. The Texas station also reports an upward trend in average gains by animals on evaluation tests from 1950 to the present with marked increases at the upper end of the distribution and small increases for those on the low end. In general, the best gainers in these tests tend to come from herds that have been under selection for growth rate. The bull with the heaviest weight for age (2.6 lbs. per day of age at finish of postweaning gain test) in 16 years of testing at Balmorhea station had progenies in the 1957 test with average gains above all other progenies in their respective tests.

Data at the Virginia station showed genetic correlations between preweaning and postweaning gains of .66 for steers and .51 for heifers. This indicates that selection for heavy weaning weights on a progeny basis should be effective in improving postweaning gain.

g. Average Growth Potential from British Type Beef Cattle Appears to be About Two-pounds Per Day.

Data from S-10 research herds and also from on-the-farm testing programs in three states show average gains adjusted for age of dam and sex of calf up to weaning in the neighborhood of 1.75 pounds per day. Average daily gain of steers and bulls on postweaning performance tests have been about 2 pounds and 2¼ pounds per day, respectively, when these tests started immediately after weaning. Life-time gains from such data turn out to be less than 2 pounds per day for steers and about 2 pounds per day for bulls. From this it appears that average growth potential for continuous growth under optimum conditions is not likely to be above 2 pounds per day on a steer basis.

h. Genetic Background Appears to Influence Carcass Grade of Beef.

At the Louisiana station, steers from 4 kinds of cows sired by 6 kinds of bulls and slaughtered at about 15 months of age showed significant differences in carcass grade between British and Zebu type calves. Carcasses from steers that were straight-bred British or crosses of British breeds averaged low-choice; British-Zebu and Zebu-British crosses averaged high-good; while Brahman, Brangus and their crosses averaged low-good. Steers sired by Charolaise bulls showed average grades similar to those sired by Brahman and Brangus bulls. Straight Brangus steers had average grades essentially the same as straight Brahman steers. The Brangus cattle in this experiment produced carcasses that graded lower than would be expected from the data in this experiment and the percentage of British blood in their foundation. Data on steers finished at the Brooksville, Florida station also showed steers of British breeding with higher average carcass grades than those containing Brahman blood. Data from another Florida station agreed with previous findings and showed carcass grade decreasing as fraction of blood changed from about 7/8 Shorthorn-1/8 Brahman, to all Brahman. These latter data also showed average tenderness rating decreasing as Brahman blood increased.

The results at the Texas and Florida stations indicated that sires within breed influenced tenderness. Estimates of heritability of tenderness from these data ranged from 25 to over 100%. In the Texas work, Brahman sires were more variable than Hereford sires with respect to tenderness.

i. Type or Conformation Scores of Live Animals Useful.

Studies of type scores from visual appraisal at several stations show fair agreement among members of grading committees and between scores of calves graded at different times. Some disagreement exists among research workers regarding the relationship between type scores and eating quality of the meat but there is a paucity of data on this where widely contrasting types or kinds were compared. Preliminary data from an experiment to measure carcass quality of steers from British, Zebu and Dairy types with environmental conditions the same from about 3 to 18-months of age at the Tennessee station showed average carcass grades as follows: Angus - high good (10.8); Brahman -

standard (7.2); Hereford - high good (11.0); Brahman-British cross-standard (7.6); Holstein - standard (7.0); and Jersey or Guernsey - high utility (5.4). Paired comparisons with roasts among the different breeds and types indicated much variability in eating quality within breeds and suggested there may be factors not associated with fatness and conformation which influence eating preference. Preference by the tasting panel tended to favor the higher grades but there was one noteworthy exception.

j. Some Newer Kinds Continue to Show Rapid Growth.

Charolaise and Charbray bulls and steers sired by them continue to show rapid growth rate at the Texas, Florida, Alabama and Louisiana stations. It appears that this breed (Charolaise) has an average growth potential which may be above the average of other breeds in the S-10 program. In general, Santa Gertrudis bulls and steers have tended to have relatively rapid growth rate in feeding trials where they have been fed along with other breeds.

k. Inbreeding Appears to Influence Reproductive Ability.

Two inbred lines of Shorthorns at the Front Royal, Virginia station appear to have lower reproductive rates and higher calf mortalities than those in the non-inbred groups. In general, calves in these inbred lines also tend to grade lower and have slower growth rates than the other Shorthorns at this station.

l. Blood Constituents as Indicators of Growth Potential.

Further investigations at the Texas station of blood constituents as indicators of growth potential in immature cattle included serum protein bound iodine (PBI), glutathione, serum proteins and serum oxidase activity. The results do not indicate that PBI in itself will account for a large fraction (less than 20%) of the variance in rates of gain. Multiple coefficients of correlation with gain as the independent variable and initial age, initial weight, glutathione/hemoglobin (GSH/Hb) ratio and $(GSH/Hb)^2$ as independent variables range from .68 to .74 in groups of Brahman, Charbray and Angus cattle. The same relationship in Hereford and in Santa Gertrudis groups was not as conclusive.

Preliminary evaluations indicated that the albumen/globulin ratio was significantly related to gain in certain animals. Correlation coefficients between serum albumen and rate of gain were significant(.40 to .45) in groups of Angus and Herefords but not significant in Santa Gertrudis.

m. Feeding Method Influences Test Gain.

The Maryland station reports that group fed animals gain faster than those fed individually on the same type ration. Those fed in groups consumed more feed per day and showed slightly less feed intake per pound of gain. At the Front Royal station, steers on a ground mixed ration and the same ration pelleted showed greater feed intake and higher daily gains than similar steers fed grain and hay separately but in the same porportion as the other two rations. It appeared that steers failed to consume as much hay where it was fed separately as when ground and mixed with the concentrates.

n. Dwarfism Studies Continued.

Use of radiograph of lumbar vertebra in young calves as a possible means of identification of dwarf carriers was continued at the Tennessee station. Up to now 1253 calves have been X-rayed at or soon after birth. Known born carriers produced by mating dwarf bulls to females in the herd were used to test the accuracy of the X-ray technique. Of 74 known carrier calves, 14 had normal appearing vertebra and 60 showed some degree of vertebra abnormality. It was also pointed out in last year's report that one heifer with a normal radiograph produced a dwarf calf. In pedigree clean groups presumed to be non-carriers, 60% of the calves were classified by radiograph as having normal vertebra and 40% as abnormal. There appears to be a relationship between abnormalities of the lumbar vertebra and the "snorter" dwarf gene but it also looks as if influences other than the dwarf gene also lead to vertebra abnormalities in cattle. Radiographs of lumbar vertebra have been quite accurate in the identification of dwarf calves but it fails to separate at all clearly carrier and non-carrier animals.

Matings at the Tennessee, Florida and Virginia stations either for the production of animals with known geno-types or to further check the genetics of dwarfism in cattle do not invalidate the hypothesis that "snorter type" dwarfism is due to a simple recessive. Matings at the Florida station indicate a relationship between "snorter" dwarfism and Brahman "midgets"; and also that some other types of dwarfism may be different genetically from "snorter" dwarfism.

Studies of blood constituents at the Texas station and hormones at the Virginia station have failed to turn up techniques that would be useful in the identification of carriers.

Attempts to verify the insulin stress technique developed by Missouri workers have failed at the Tennessee and Texas stations. It appears that this technique needs further investigation before it is recommended for general use.

## Interest of Public in Project

On-the-farm testing programs for beef cattle continue to increase throughout the region. At least three gain evaluation testing stations sponsored by the extension service and breeders have been set up to measure gainability of young bulls. Sale catalogs by breeders in which performance information is given on part or all of the individuals in the sale are not uncommon. At the Ocala, Florida commercial bull sale last February, 125 bulls were weighed and graded as a service to buyers prior to the sale. In a sale of some 600 purebred heifers at Culpeper, Virginia, weights and grades on each animal was included in the sale catalog. It is apparent that methods developed in this program are leading to improved breeding programs and selection practices throughout the industry.

Field days and sales at stations where performance information was given have been well attended. In general, the prices paid at these sales have indicated that the buyers were willing to pay for superior performance. At the Alabama sale last spring the bull with highest index topped the sale at $925.

State and local beef cattle breeders' conferences and meetings have usually included in their program one or more phases of the beef cattle breeding research in the state or region. Performance testing in particular continues to be a live subject at beef cattle meetings and also in breed journals and magazines. Commercial steer feeders are also showing interest in performance testing programs as a means for locating more efficient feeders.

Table 1. NUMBER OF CALVES IN DIFFERENT TYPES OF MATINGS FOR 1957 CALVES AT STATIONS COOPERATING IN S-10 PROJECT

| Type of Mating | Number of Matings by States | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ala | Ark | Fla | Ga | Ia | Md | Miss | N.C. | S.C. | Tenn. | Tex | Va. | Total |
| **Inter se*** | | | | | | | | | | | | | |
| Angus (Ang) | 51 | 137 | 30 | 56 | 14 | 30 | 60 | 20 | | 348 | | 212 | 958 |
| Hereford (Herf) | 88 | 72 | 37 | 116 | 8 | 30 | 120 | 155 | | 606 | 154 | 133 | 1519 |
| Shorthorn (Sh) | 27 | 17 | 31 | | | | | 9 | | | | 183 | 267 |
| Brahman (Brah) | | | 58 | | 43 | | | | | | 58 | | 159 |
| Santa Gertrudis (SG) | | | 46 | 9 | | | | | | | 31 | | 86 |
| Charbray (Chb) | | | | | | | | | | | 74 | | 74 |
| Brah-Ang (Brang) | | | 44 | | 141 | | | | | | | | 185 |
| Brah-Herf | | | | | | | | 34 | | | | | 34 |
| Afrik-Ang | | | | | 59 | | | | | | | | 59 |
| Afrik-Ang-Herf | | | | | | | | 19 | | | | | 19 |
| Romo Carolina | | | | | | | | 10 | | | | | 10 |
| **Crosses** | | | | | | | | | | | | | |
| Ang-Herf | | | | 14 | 16 | | | | | | | 26 | 56 |
| Ang-Sh | | | | | 8 | | | | 12 | | | 18 | 38 |
| Herf-Sh | | | | | 8 | | | | | | | 20 | 28 |
| Ang-Herf-Sh | | | | | | | | | 11 | | | 28 | 39 |
| Ang-Brah | | | | | 16 | | | | | | | | 16 |
| Herf-Brah | | | | | 16 | | | | | | 104 | | 120 |
| Sh-Brah | | | | 318 | 8 | | | | | | | | 326 |
| Ang-Sh-Brah | | | | | | | | | 11 | | | | 11 |
| Herf-Sh-Brah | | | | | | | | | 11 | | | | 11 |
| Ang-Brang | | | | | 16 | | | | | | | | 16 |
| Herf-Brang | | | | | 16 | | | | | | | | 16 |
| Sh-Brang | | | | | 8 | | | | | | | | 8 |
| Brah-Brang | | | | | 16 | | | | | | | | 16 |
| Ang-S.G. | | | | 6 | | | | | | | | | 6 |
| Herf-S.G. | | | | 9 | | | | | | | 27 | | 36 |
| Ang-Herf-S.G. | | | | 14 | | | | | | | | | 14 |
| Herf-Brah-S.C. | | | | | | | | | | | 8 | | 8 |
| Herf-R.P.-Brah-S.G. | | | | | | | | | | | 3 | | 3 |
| S.G.-R.P. | | | | | | | | | | | 14 | | 14 |
| Charl-Ang | | | | | 8 | | | | | | | | 8 |
| Charl-Herf | | | | | 8 | | | | | | 10 | | 18 |
| Charl-Brah | | | | | 8 | | | | | | | | 8 |
| Charl-Brang | | | | | 8 | | | | | | | | 8 |
| Charl-Herf-Brah | | | | | | | | | | | 8 | | 8 |
| TOTAL | 166 | 226 | 246 | 542 | 425 | 60 | 180 | 247 | 45 | 954 | 491 | 620 | 4202 |

* Breeds or strains not shown in those abbreviated in the table as follows: Afrikander (Afrik); Charolaise (Charl); Red Polled (R.P.).

ALABAMA STATION

-by-

T. B. Patterson, W. M. Warren, and G. B. Meadows

I. Project Title: No. Alabama 525, Contributing to S-10,

The Evaluation of Performing Ability in Purebred and Crossbred Beef Cattle.

II. Objectives:

(1) To determine the effectiveness of mass selection for total performance in beef cattle.

(2) To develop criteria for evaluating and selecting breeding animals.

(3) To study the influence of heterosis in crosses between the three British breeds of beef cattle.

III. Accomplishments During the Year:

(1) Facilities and cattle acquired: Approximately 950 acres of land, located in the Piedmont section of Alabama, is used in this project. The land represents partly abandoned eroded crop land that is rough and quite rocky in places. Roughly 550 acres of this land has been reclaimed and put in either permanent type pasture or in temporary pasture and hay crops. Continuation of clearing, seeding and fencing operations are proceeding as labor and facilities permit. Pastures are being fenced in about 40 acre sizes in order to permit pasture mating as soon as sufficient space is available.

Due to the nature of the piedmont soil, a Rome off-set disk harrow weighing 8500 pounds was obtained to facilitate clearing operations and in preparation of seed buds for planting.

Feeding facilities include grain storage bins, hammer mill, feed mixer with molasses attachment, and eleven pens with shed designed for group feeding. The majority of the feeding however, is done in open bunks on pasture.

Two bulls, one Hereford and one Angus, were acquired for use in the breeding herd. In addition, two bulls were retained from last years performance test. Selection of these bulls, one Hereford and one Angus, was based on total performance with equal value given to weight per day of age, gain on test, and conformation. Using the same criteria of evaluation, 13 Angus, 17 Hereford and 9 Shorthorn heifers were retained in the breeding herd.

(2) Research results: The fifth calf crop in the Angus and Hereford lines and the fourth calf crop in the Shorthorn line were born during the year. Data collected on these calves include birth weight, 180-day weight, weaning weight (250 days), and weaning score. All heifer calves have been placed on 140-day post-weaning performance test. Selected bulls, including 14 Herefords, 8 Angus and 2 Shorthorn as well as 48 breeder bulls, have been placed on 140-day post-weaning test.

A 140-day post-weaning performance test was completed during the year on 30 breeder and 18 Experiment Station bulls, and a 133-day test was completed on 59 Station heifers.

Initial matings were made designed to accomplish objective 3. Limited Shorthorn females and reproductive difficulties in the Shorthorn herd prevented starting as called for in the plans. Actual matings were made as follows:

| Breed and No. of cows | Breed of Bull | | | | | |
|---|---|---|---|---|---|---|
| | Hereford 1 | Hereford 2 | Angus 1 | Angus 2 | Shorthorn 1 | Shorthorn 2 |
| 24 Hereford | 6 | 6 | 3 | 3 | 3 | 3 |
| 24 Angus | 3 | 3 | 6 | 6 | 3 | 3 |
| 24 Shorthorn | 3 | 3 | 3 | 3 | 6 | 6 |

Calves from the above matings are being born at the present time.

IV. Future Plans:

(1) Improvement of facilities: Clearing of land, seeding of pastures, building of fences, and general improvement of facilities will be continued as rapidly as possible.

(2) Sufficient data are now available so that calculation of correction factors for sex of calf and age of dam may be made.

(3) Selection indexes will be set up as soon as sufficient data are available to give reliable heritability estimates.

(4) Continuation of objectives 1, 2 and 3.

V. Publications Planned:

None.

# POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Alabama Agricultural Experiment Station

| Line or group designation | Hereford | Angus | Shorthorn |
|---|---|---|---|
| Location | A.P.I. | A.P.I. | A.P.I. |
| Breeding of calves | Hereford | Angus | Shorthorn |
| Av. inbreeding (%) | 0 | 0 | 0 |
| Bulls, No. | 8 | 7 | 5 |
| Av. inbreeding | 0 | 0 | 0 |
| Av. weaning wt. | 511 | 548 | 496 |
| Av. 12 month wt. | 658 | 752 | 663 |
| Length of feeding period | 140 da. | 140 da. | 140 da. |
| *Feed per cwt. gain (lbs) | | | |
| Concentrates | 833 | 833 | 833 |
| Roughage | 225 | 225 | 225 |
| Av. daily gain on test | 2.20 | 2.22 | 2.49 |
| Av. type score (12 months) | 13 | 14 | 12 |
| Heifers, No. | 27 | 22 | 10 |
| Av. inbreeding (%) | 0 | 0 | 0 |
| Av. weaning wt. | 433 | 449 | 409 |
| Av. 12 month wt. | 513 | 459 | 492 |
| Length of feeding period | 133 da. | 133 da. | 133 da. |
| Feed per cwt. gain (lbs). | | | |
| Concentrates | | | |
| Roughage | | | |
| Av. daily gain on test | 1.74 | 1.62 | 1.64 |
| Av. type score (12 months) | | | |

* This feed per cwt. gain is based on all bulls on our 1956-57 bull test. The bulls were group fed and included 34 bulls from breeders in the state.

# PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE NOT INCLUDED IN BREEDING HERDS IN 1957

Alabama Station

| Line or group designation | Short fed | Short fed | Short fed | Long fed |
|---|---|---|---|---|
| Breeding: | Hereford | Angus | Shorthorn | Hereford |
| Sex: | Steers | Steers | Steers | Steers |
| No. | 6 | 8 | 3 | 8 |
| Av. age (fall 1956) 11-1-56 | 344 | 323 | 315 | 348 |
| Av. wt. (fall 1956) 11-1-56 | 537.3 | 537.4 | 517.4 | 595.9 |
| Days on pasture | 364 | 343 | 335 | 167 |
| Av. gain on pasture 1/ | 0.84 | 0.94 | 0.76 | 1.45 |
| Days on feed | 91 | 91 | 91 | 153 |
| Av. wt. adjusted to 18 or 30 months of age | 706.0 | 752.0 | 697.0 | 983.8 |
| Av. gain on feed | 2.42 | 2.42 | 2.40 | 1.79 |
| Animals slaughtered: | | | | |
| Av. age at slaughter | 706 | 685 | 677 | 571 |
| Av. slaughter weight | 985.5 | 1025.6 | 966.7 | 969.4 |
| Av. slaughter grade | 11.1 | 12.2 | 9.0 | 13.0 |
| Av. dressing percent | 61.5 | 62.5 | 54.2 | 62.3 |
| Av. carcass grade | 9.5 | 11.5 | 9.0 | 13.4 |

1/ Fed some grain on summer and fall pasture.

PERFORMANCE OF COW HERDS. 1957 CALVES

Alabama Station

| Line of group designation | Hereford | Angus | Shorthorn |
|---|---|---|---|
| Location | A.P.I. | A.P.I. | A.P.I. |
| Breed of sire | Hereford | Angus | Shorthorn |
| Breed of dam | Hereford | Angus | Shorthorn |
| No. cows bred | 88 | 51 | 27 |
| No. cows calving | 73 | 38 | 14 |
| No. calves raised | 66 | 35 | 13 |
| Av. inbr. of dams (%) | 0 | 0 | 0 |
| Av. inbr. of calves (%) | 0 | 0 | 0 |
| Av. birth date | 11-18-56 | 12-1-56 | 12-23-56 |
| Av. birth wt. (lbs): | | | |
| Bulls | 70.3 | 57.5 | 72.4 |
| Heifers | 64.0 | 49.2 | 64.5 |
| Were calves creep fed? | no | no | no |
| Av. wt. at six months (lbs): | | | |
| Bulls | 365.0 | 394.6 | 435.0 |
| Steers | 348.3 | 407.5 | 440.0 |
| Heifers | 343.9 | 364.7 | 326.0 |
| Av. weaning date: | | | |
| Bulls | 7-24-57 | 8-14-57 | 8-7-57 |
| Steers | 6-26-57 | 7-10-57 | 6-26-57 |
| Heifers | 7-31-57 | 8-7-57 | 9-18-57 |
| Av. weaning wt:* | | | |
| Bulls | 540.7 | 522.9 | 527.5 |
| Steers | 467.7 | 554.0 | 550.0 |
| Heifers | 468.3 | 488.4 | 423.0 |
| Av. weaning type score: | | | |
| Bulls | 11.1 | 10.7 | 13.0 |
| Steers | --- | --- | --- |
| Heifers | 11.3 | 12.2 | 11.1 |
| Calves slaughtered at weaning: | None | None | None |

* Adjusted for age of dam.

## Rations Fed

### Bulls

| | |
|---|---|
| Alfalfa hay | 10% |
| Snapped corn | 68% |
| Cottonseed meal | 10% |
| Cottonseed hulls | 11% |
| Salt | 1% |
| Coastal Bermuda hay | Free choice |

### Steers

| | |
|---|---|
| Alfalfa hay | 6% |
| Coastal Bermuda hay | 6% |
| Snapped corn | 80% |
| Cottonseed meal | 6.5% |
| Salt | 1% |
| Steamed bone meal | 0.5% |

### Heifers

| | |
|---|---|
| Alfalfa hay | 25% |
| Coastal hay | 17% |
| Cottonseed hulls | 5% |
| Snapped corn | 45% |
| Cottonseed meal | 7% |
| Salt | 1% |

ARKANSAS STATION

-by-

C. J. Brown

I. Project Title: Evaluation of Performance Records of Beef Cattle.

II. Objectives:

To develop practical but adequate methods for identifying, evaluating and propagating the genetic potential for the production of beef. This would involve determination of the kind and number of performance records necessary to prove beef sires and dams, as well as the proper use of records in planning matings.

III. Accomplishments During the Year:

(a) The following facilities were acquired during the last year:
Approximately two miles of fence built.
Approximately 100 acres of pasture fertilized and seeded to winter small grain with a grassland drill.
Cattle acquired include 4 Shorthorn, 13 Hereford, and 50 Aberdeen-Angus heifers grown out as replacement.
One six-year old Shorthorn bull.
Two yearling Angus bulls and one Angus bull calf.
Service of one Hereford was leased for one breeding season.
10 yearling Polled Hereford heifers were purchased.

(b) Results of the research conducted during the past year include data obtained on the following phases of reproduction and is in various stages of summary.

Sixty bulls were fed individually for 154 days to obtain measures of gain and efficiency. A selected group of these bulls were sold at auction and buyers evaluation of performance records were determined.

Digestibility of ration components were determined for two bulls from each of six sire progeny groups.

Three young bulls were fed for cooperating breeders.

Weights and body measurements were recorded on all young and mature animals.

All animals were classified for type and breeding worth by a committee of judges.

Milk production and behavior patterns of 27 Aberdeen-Angus calves and dams were recorded.

All weight and measurement data from the Main Station have been transcribed to IBM cards.

IV. Future Plans:

Future plans are to continue with the collection and analysis of data toward the above outlined objectives. This will include the individual feeding of young bull progeny from station sires and cooperators to study factors which determine differences in rate and efficiency of gain. Continue studies of visual appraisal of cattle, growth and development, milk production and mothering ability. Continue development of lines within herds based on performance. Cooperate with Extension Service in production testing programs in order to locate cattle of superior merit.

V. Publications During Year:

Brown, C. J., Heritability of Weight and Certain Body Dimensions of Beef Calves at Weaning. 1957, Station Bulletin in Press.

Brown, C. J., Maurice L. Ray, and Warren Gifford. 1957. Some Factors Affecting the Efficiency of Feed Utilization of Bulls on Gain-evaluation Test, (Abstract) Jour. Animal Sci. 16:1026.

VI. Publications Planned:

Bulletin on Feed Lot Performance of Bulls.
Bulletin on Cow Performance.

POST WEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Arkansas Station

| Line or group designation | | | |
|---|---|---|---|
| Location | Main Sta. | Main Sta. | Coop |
| Breeding of calves | Angus | Hereford | Hereford |
| Av. inbreeding (%) | 2.77 | 5.46 | 0 |
| Bulls, No. | 26 | 34 | 3 |
| Av. inbreeding (%) | 2.77 | 5.46 | |
| Av. weaning wt. | 381 | 363 | 448 |
| Av. 12 month wt. | 694 | 667 | |
| Length of feeding period | 154 days | 154 days | 154 days |
| Feed per cwt. gain (lbs) | | | |
| Concentrates | 522 | 525 | 520 |
| Roughage | 261 | 262.5 | 260 |
| Av. daily gain on test | 2.29 | 2.20 | 2.44 |
| Av. type score (12 months) | 68 | 68.3 | 74.0 |

PERFORMANCE OF COW HERDS. 1957 CALVES

Arkansas Station

| Line of group designation | | Main | Station | |
|---|---|---|---|---|
| Location | | | | |
| Breed of sire | Shcrthorn | Shorthorn | Hereford | Hereford |
| Breed of dam | Shorthorn | Shorthorn | Hereford | Hereford |
| No. cows bred | 17 | | 72 | |
| No. cows calving | 10 | 3 | 37 | 20 |
| No. calves raised | 9 | 3 | 36 | 15 |
| Av. inbr. of dams (%) | 0 | 0 | .34 | .86 |
| Av. inbr. of calves (%) | 0 | 0 | .55 | 1.25 |
| Av. birth date | 10/9/56 | 3/4/57 | 10/5/56 | 3/21/57 |
| Av. birth wt. (lbs) | | | | |
| Bulls | 70 | 71 | 65 | 66 |
| Heifers | 69 | 75 | 62 | 60 |
| Av. wt. at six months (lbs) | | | | |
| Bulls | 365 | 293 | 290 | 359 |
| Heifers | 323 | 369 | 263 | 356 |
| Av. weaning date: | | | | |
| Steers | 5/2/57 | 9/20/57 | 4/29/57 | 10/24/57 |
| Av. weaning wt: c/w 7 mo. | | | | |
| Bulls | 403 | 343 | 336 | 411 |
| Heifers | 354 | 420 | 310 | 386 |

# PERFORMANCE OF COW HERDS. 1957 CALVES

Arkansas Station

| Line of group designation<br>Location | ----Main Station | | ---Livestock & Forestry | |
|---|---|---|---|---|
| Breed of sire | Angus | Angus | * | Angus |
| Breed of dam | Angus | Angus | | Angus |
| No. cows bred | 94 | | | 43 |
| No. cows calving | 33 | 35 | 8 | 20 |
| No. calves raised | 32 | 38 | 8 | 19 |
| Av. inbr. of dams (%) | 1.82 | 1.25 | .90 | 0 |
| Av. inbr. of calves (%) | 2.95 | .52 | 0 | 0 |
| Av. birth date | 10/8/56 | 3/5/57 | 4/17/57 | 12/6/56 |
| Av. birth wt. (lbs) | | | | |
| Bulls | 59 | 61 | 80 | 64 |
| Heifers | 54 | 66 | 77 | 54 |
| Av. wt. at six months (lbs) | | | | |
| Bulls | 313 | 345 | -- | 383 |
| Heifers | 280 | 329 | 40 | 344 |
| Steers | --- | -- | 376 | --- |
| Av. weaning date | | | | |
| Steers | 5/27/57 | 10/4/57 | 11/15/57 | 5/18/57 |
| Av. weaning wt: c/w 7 mo. | | | | |
| Bulls | 367 | 379 | -- | 427 |
| Steers | --- | --- | 403 | --- |
| Heifers | 327 | 358 | 446 | 386 |

* Crossbred calves from a stray bull.

FLORIDA STATION
-by-
Marvin Koger

I. Project Title: No. 752

Genetics of Dwarfism in Beef Cattle.

II. Objectives:

A. To describe and characterize the various types of dwarfism manifested in beef cattle of various breeds in Florida.

B. To investigate the genetic relationship between the more prevalent types of dwarfism.

C. To determine the influence of genetic environment on expression of the snorter dwarf gene.

III. Accomplishments During the Year:

A. Facilities and cattle acquired:

Fifteen acres of pasture was established and approximately 15 animals added to the breeding herd.

B. Research results:

Additional matings were made which should yield approximately 40 dwarf x dwarf or dwarf x known carrier offspring in 1958. Critical results in 1957 included a calf from a snorter Hereford x Midget Brahman mating which apparently was an extreme snorter; a snorter Hereford x snorter Angus which yielded a snorter calf; and snorter Hereford x Brahman-Native cows which produced calves which were more compact, slower in growth, but higher in grade than calves sired by clean Hereford bulls from similar cows.

IV. Future Plans:

More test matings will be made and the results through the 1958 calf crop will be summarized and published.

V. Publications During the Year:

Koger, M. Midgetism in the American Brahman. International Review 3: (10) pp. 6. January, 1957.

Koger, M., R. W. Kidder, H. V. Clum and J. M. Liddon. The Relationship of Birth Weights to Growth at Various Stages of Development in Cattle of Various Breeding at the Florida Everglades Experiment Station. Journal Animal Science. November 1957. (Abstract).

Dollahon, J. C., M. Koger, J. F. Hentges and A. C. Warnick. The Expression of Various Forms of Dwarfism in Certain Crosses and Heterogeneous Genetic Background in Beef Cattle. Journal Animal Science, November 1957. (Abstract).

I. Project Title: No. 615.

Influence of Breed Composition and Level of Nutrition on Adaptability of Cattle to Central Florida Conditions.

II. Objectives:

To determine the relative productivity of cows with different proportions of English and Brahman blood when run under pasture programs designed to supply low, medium, and good nutrition levels.

III. Accomplishments During the Year:

A. Facilities and cattle acquired:

Seven head of Shorthorn and 7 head of Brahman cattle were purchased to add to breeding herds. Numbers in crossbred groups were increased in some groups by adding station raised females. These additions nearly complete the numbers called for in project outline.

B. Research results:

Results from the 1957 calf crop showed significant effects due to nutrition-pasture regime and to breed groups. A breed x program interaction approaching significance was noted. A comparison of growth rates of crossbred groups with that of the Shorthorn and Brahman groups indicated a highly significant amount of hybrid vigor in the crosses. Cattle heavy in Brahman breeding had similar growth rates on the three nutritional programs, while the crossbreds and Shorthorns weaned heavier calves as the nutrition program improved.

IV. Future Plans:

Additional animals will be added to some groups to bring numbers to the desired level. The project will be continued as outlined until the desired information is accumulated.

I. Project Title: No. 629.

Selection of Cattle for Beef Production in Southeastern United States.

II. Objectives:

To improve the reproductive efficiency and meat producing qualities of different strains of cattle under Florida conditions, to test various breeding systems with these cattle, and to determine if combining ability can be increased by cross progeny testing.

III. Accomplishments During the Year:

A. Facilities and cattle acquired:

Approximately 400 acres of pasture was cleared of excess trees

and renovated. Some additional fields were planted to permanent grass pasture. Approximately 50 head of females were added from the Jeanerette and Front Royal herds.

B. Research results:

The customary data from breeding herds were obtained. The results indicate that detectable progress has been made in selecting for better mothering ability in the Angus and Hereford herds and in reproductive efficiency in the Brangus herd. Different methods of wintering replacement heifers were studied and the steers from the '56 calf crop were fed in the summer of 1957, testing the effectiveness of adding alfalfa leaf meal to the ration and of implanting stilbestrol. Alfalfa meal had no measurable affect. Stilbestrol increased feed-lot gains but reduced grade to the extent that the non-treated steers returned an average of approximately $20 more per head when sold on yield and grade. Carcass data was obtained and will be reported later.

IV. Future Plans:

Numbers in the foundation herds will be increased by adding station-raised females and by purchase of additional animals. Three miles of fence will be added and 200 acres of new pasture planted preparatory to adding a commercial herd for testing breeding systems and obtaining information on specific combining ability. Summaries of the results from the first 5 years of the project will be published in 1958.

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Brooksville, Florida Station

| Line or group designation | Hereford | Angus | Brahman | Brangus | Santa Gert. |
|---|---|---|---|---|---|
| Location | | | Brooksville | | |
| Breeding of calves | Hereford | Angus | Brahman | Brangus | Santa Gert. |
| Av. inbreeding (%) | - | - | - | - | - |
| Bulls, No. | 5 | 2 | 2 | 1 | 3 |
| Av. inbreeding (%) | - | - | - | - | - |
| Av. weaning wt. | 374.4 | 389.5 | 454.5 | 550.0 | 470.3 |
| Av. 12 month wt. | 621.0 | 662.0 | 625.0 | 765.0 | 817.0 |
| Length of feeding period | 140 da. | 140 da. | 140 da. | 140 da. | 140 da. |
| Feed per cwt. gain (lbs) | 798.96 | 827.40 | 851.05 | 884.24 | 809.58 |
| Concentrates | 538.65 | 570.28 | 573.50 | 598.85 | 554.88 |
| Roughage | 260.31 | 257.12 | 277.55 | 285.39 | 254.70 |
| Av. daily gain on test | 2.35 | 2.25 | 2.20 | 2.49 | 2.59 |
| Av. type score (12 months) | 10.5 | 11.0 | 9.0 | 11.0 | 10.3 |
| *Steers, No. | 9 | 12 | 6 | 10 | 11 |
| Av. inbreeding (%) | - | - | - | - | - |
| Av. weaning wt. | 298.0 | 338.0 | 347.0 | 369.0 | 411.0 |
| Av. 12 month wt. | 384.0 | 457.0 | 437.0 | 451.0 | 560.0 |
| Length of feeding period | 128 da. | 128 da. | 128 da. | 128 da. | 128 da. |
| Feed per cwt. gain (lbs) | 771.08 | 1185.18 | 612.44 | 815.28 | 492.30 |
| Concentrates | 424.09 | 651.85 | 336.84 | 448.41 | 270.76 |
| Roughage | 346.99 | 533.33 | 275.60 | 366.87 | 221.54 |
| Av. daily gain on test | .43 | .38 | .54 | .41 | .68 |
| Av. type score (12 months) | 11.0 | 11.2 | 8.8 | 9.5 | 10.8 |
| *Heifers, No. | 7 | 10 | 8 | 7 | 4 |
| Av. inbreeding (%) | - | - | - | - | - |
| Av. weaning wt. | 321.0 | 357.0 | 323.0 | 376.0 | 462.0 |
| Av. 12 month wt. | 438.0 | 486.0 | 443.0 | 497.0 | 628.0 |
| Length of feeding period | 128 da. | 128 da. | 128 da. | 128 da. | 128 da. |
| Feed per cwt. gain (lbs) | 934.80 | 1333.33 | 3200.00 | 842.10 | 739.88 |
| Concentrates | 513.86 | 733.33 | 1760.00 | 463.16 | 406.94 |
| R Roughage | 420.44 | 600.00 | 1440.00 | 378.94 | 332.94 |
| Av. daily gain on test | .38 | .25 | .10 | .39 | .45 |
| Av. type score (12 months) | 11.3 | 11.6 | 8.7 | 10.3 | 10.2 |

* Steer and heifers were run together in three separate lots receiving 1.5 lbs. CSM, 2 lbs. citrus molasses, 2 lbs. ground snapped corn and 4.5 lbs. chopped hay per day.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1957

Brooksville, Florida Station

1956 Heifer calves (yearlings)

| Line or group designation | Hereford | Angus | Brahman | Brangus | Santa Gert. |
|---|---|---|---|---|---|
| Breeding | Hereford | Angus | Brahman | Brangus | Santa Gert. |
| Sex: | Female | Female | Female | Female | Female |
| No. | 6 | 10 | 8 | 6 | 4 |
| Av. age (fall 1956) | 270 | 300 | 270 | 270 | 270 |
| Av. wt. (fall 1956) | 400.0 | 453.0 | 412.0 | 469.0 | 567.0 |
| Days on pasture | ---------- | --Run on pasture continually | | | ---------- |
| *Av. gain on pasture | 203. | 154. | 179. | 165. | 227.0 |

* Summer gain from 3/8/57 to 8/27/57 (172 days)

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1957

| Line or group designation | Hereford | Angus | Brahman | Brangus | Santa Gert. |
|---|---|---|---|---|---|
| Breeding: | Hereford | Angus | Brahman | Brangus | Santa Gert. |
| Sex: | Steers | Steers | Steers | Steers | Steers |
| No. | 9 | 12 | 6 | 10 | 11 |
| Av. age (fall 1956)11-27 | 291.0 | 361.0 | 274.0 | 301.0 | 308.0 |
| Av. wt. (fall 1956)11-27 | 328.4 | 407.6 | 367.3 | 401.1 | 476.9 |
| Days on pasture | 101 | 101 | 101 | 101 | 101 |
| Av. gain on pasture | 55.4 | 29.3 | 69.4 | 50.4 | 83.2 |
| Days on feed | 112 | 112 | 112 | 112 | 112 |
| Av. gain on feed | 278.1 | 231.2 | 288.7 | 256.6 | 329.4 |
| Animals Slaughtered: | | | | | |
| Av. age at slaughter | 403. | 473. | 386. | 413. | 420. |
| Av. slaughter weight | 369.3 | 388.3 | 411.7 | 404.6 | 506.4 |
| Av. dressing percent | 54.52 | 55.42 | 56.14 | 56.14 | 55.49 |
| Av. carcass grade | 8.3 | 9.8 | 7.5 | 7.2 | 7.7 |

Ration on pasture consisted of 1.5 lbs. CSM, 2 lbs. ground snapped corn, 2 lbs. citrus molasses and 4.5 lbs. chopped hay per day self fed.

Ration in dry lot consisted of 1/3 citrus pulp, 1/3 citrus molasses, 1/3 ground snapped corn, 2.25 lbs. cottonseed meal and hay free choice fed once daily.

# PERFORMANCE OF COW HERDS. 1957 CALVES

Brocksville, Florida Station

| Line of group designation | Hereford | Angus | Brahman | Brangus | Santa Gert. |
|---|---|---|---|---|---|
| Location | Brooksville | | | | |
| Breed of sire | Hereford | Angus | Brahman | Brangus | Santa Gert. |
| Breed of dam | Hereford | Angus | Brahman | Brangus | Santa Gert. |
| No. cows bred | 37 | 30 | 32 | 44 | 46 |
| No. cows calving | 29 | 25 | 19 | 34 | 27 |
| No. calves raised | 25 | 25 | 19 | 33 | 25 |
| Av. inbr of dams (%) | - | - | - | - | - |
| Av. inbr. of calves (%) | - | - | - | - | - |
| Av. birth date | 2/1/57 | 1/17/57 | 2/6/57 | 1/26/57 | 1/21/57 |
| Av. birth wt. (lbs) | | | | | |
| Bulls | 63.4 | 57.9 | 64.9 | 66.9 | 68.3 |
| Heifers | 59.6 | 52.3 | 59.7 | 61.8 | 63.2 |
| Were calves creep fed? | no | no | no | no | no |
| Av. wt. at six months (lbs) | | | | | |
| Bulls | 309.2 | 334.8 | 328.5 | 386.5 | 395.8 |
| Steers | 250.7 | 274.2 | 239.0 | 327.2 | 321.8 |
| Heifers | 270.7 | 267.3 | 266.1 | 326.6 | 326.4 |
| Av. weaning date | 8/26/57 | 8/26/57 | 8/26/57 | 8/26/57 | 8/26/57 |
| Av. weaning wt. | | | | | |
| Bulls | 342.2 | 388.2 | 425.7 | 470.2 | 497.3 |
| Steers | 305.7 | 330.9 | 326.4 | 399.4 | 412.2 |
| Heifers | 312.2 | 331.1 | 342.6 | 394.6 | 418.4 |
| Av. weaning type score | | | | | |
| Bulls | 10.5 | 10.5 | 8.5 | 9.5 | 7.8 |
| Steers | 9.8 | 10.0 | 7.2 | 8.5 | 6.2 |
| Heifers | 10.4 | 9.9 | 7.7 | 8.5 | 8.2 |
| Av. weaning condition score | | | | | |
| Bulls | 6.0 | 7.4 | 8.0 | 8.2 | 7.0 |
| Steers | 6.3 | 6.4 | 7.0 | 7.4 | 5.8 |
| Heifers | 6.7 | 6.3 | 7.2 | 8.4 | 7.7 |

# PERFORMANCE OF COW HERDS. 1957 CALVES

Range Cattle Station, FloridaStation

| Line of group designation | Project 615 | | | | | | Other* |
|---|---|---|---|---|---|---|---|
| Location | | | | | | | |
| Breed of sire | B | B | B | Sh | Sh | Sh | B & Sh |
| Breed of dam | B | 3/4B | 1/2B | 1/2B | 1/4B | Sh | Variable |
| No. cows bred | 26 | 29 | 29 | 30 | 18 | 31 | 260 |
| No. cows calving | 20 | 20 | 26 | 22 | 13 | 25 | 183 |
| No. calves raised | 20 | 20 | 26 | 22 | 13 | 25 | 175 |
| Av. birth date: | February 1 | | | | | | |
| Were calves creep fed | NO | | | | | | |
| Av. wt. at six months (lbs) | | | | | | | |
| Bulls | 332 | -- | -- | -- | -- | -- | -- |
| Steers | 319 | 339 | 392 | 386 | 330 | 309 | 409 |
| Heifers | 298 | 300 | 382 | 357 | 318 | 290 | 363 |
| Av. weaning wt: | | | | | | | |
| Bulls | 377 | -- | -- | -- | -- | -- | -- |
| Steers | 355 | 411 | 455 | 476 | 368 | 370 | 478 |
| Heifers | 333 | 369 | 412 | 441 | 412 | 320 | 427 |
| Av. weaning type score: | | | | | | | |
| Bulls | 9.1 | -- | -- | -- | -- | -- | -- |
| Steers | 8.0 | 10.1 | 10.5 | 11.0 | 10.1 | 9.5 | 9.9 |
| Heifers | 9.3 | 9.6 | 10.0 | 11.1 | 10.4 | 10.4 | 9.9 |
| Av. weaning condition score: | | | | | | | |
| Bulls | 6.9 | -- | -- | -- | -- | -- | -- |
| Steers | 8.0 | 8.3 | 9.2 | 9.4 | 7.8 | 7.9 | 9.6 |
| Heifers | 7.9 | 8.5 | 9.0 | 9.6 | 9.5 | 8.6 | 9.8 |

* Includes all cattle other than those in project 615 pastures.

# POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING (or pastured for high gains)

Range Cattle Experiment Station

| Line or group designation | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Location | Range Cattle Experiment Station | | | | | |
| Breeding of calves | 7/8Sh-1/8 Br | 3/4 Sh-1/4 Br | ½ Sh-½ Br | 3/4 Br-¼ Sh | 7/8 Br-1/8 Sh | Brahman |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 | 0 | 0 |
| Steers, No. | 2 | 9 | 4 | 3 | 5 | 1 |
| Av. inbreeding (%) | - | - | - | - | - | - |
| Av. weaning wt. | 473 | 601 | 593 | 643 | 492 | 365 |
| Av. 12 month wt, | 616 | 800 | 844 | 864 | 731 | 705 |
| Length of feeding period | 105 da | 148 da | 175 da | 117 da | 126 da | 210 da |
| Feed per cwt gain (lbs) | | | | | | |
| Concentrates | 785 | 785 | 774 | 804 | 715 | 682 |
| Roughage | 100 | 100 | 99 | 123 | 85 | 102 |
| Av. daily gain on test | 1.43 | 1.84 | 2.20 | 2.01 | 2.03 | 1.83 |
| Av. type score (12 mos) | 11 | 12 | 11 | 11 | 10 | 9 |

GEORGIA STATION
--by--
W. C. McCormick

I. Project Title: No. S-10 -- State No. A. H. 1. 1-2-3

The Improvement of Beef Cattle in Georgia Through the Use of Selection for Economic Factors Brought Out in the Process of Inbreeding, Crossbreeding and Outbreeding.

II. Objectives:

A. "Sire testing studies with Polled Hereford and Angus Cattle."

B. "To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for economical beef production when using bulls of the Polled Hereford, Angus and Santa Gertrudis breeds."

III. Accomplishments During the Year:

A. Studies with the Polled Hereford and Angus herds are being revised. Studies with Polled Herefords pertaining to selection for single traits have been transferred to the Prison farm at Reidsville, Georgia. Plans have been initiated to set up four groups of 50 grade Polled Hereford females to study selection for weaned weight, rate of gain, and visual appraisal or score. The fourth group will be an average herd. Bulls will be obtained from the Tifton herd. A formal project is being written for this study. During the spring of 1957, 100 young cows were randomly assigned to the four groups in units of 25 each.

The Polled Hereford herd of approximately 100 females at Tifton has been divided into an A and B unit with 25 and 75 cows being placed into each unit, respectively. The best available tested sires will be mated to the A unit whereas the remaining group will be used for progeny testing sires raised in the herd and also prospective outcross sires. The Angus herd will also be used in progeny testing. Major emphasis in selecting breeding animals for these herds will be placed on weaned weight, post weaning growth rate, and conformation score.

The following table summarizes records for 1956-57.

| | | No. Progeny | | Rate of Gain | | Type Score | | Final Rating | |
|---|---|---|---|---|---|---|---|---|---|
| Breed | Sire | Bulls | Heifers | Bulls | Heifers | Bulls | Heifers | Bulls | Heifers |
| P.H. | 441 | 10 | 8 | 2.37 | 1.87 | 36.38 | 35.12 | 83.80 | 70.61 |
| P.H. | 1314 | 10 | 6 | 2.13 | 1.51 | 35.00 | 34.26 | 77.50 | 64.50 |
| P.H. | F-27 | 5 | 5 | 2.46 | 1.90 | 29.94 | 36.53 | 79.02 | 74.57 |
| P.H. | 534 | 7 | 6 | 2.17 | 1.58 | 28.07 | 29.02 | 71.38 | 60.62 |
| P.H. | 508 | 12 | 6 | 2.44 | 1.95 | 33.65 | 34.76 | 82.45 | 73.82 |
| Angus | 153 | 5 | 5 | 2.27 | 1.72 | 33.06 | 32.59 | 78.46 | 66.99 |
| Angus | 306 | 6 | 7 | 2.01 | 1.53 | 34.26 | 36.17 | 74.46 | 66.69 |
| Angus | EB28E | 4 | 4 | 2.11 | 1.44 | 31.32 | 31.47 | 73.57 | 60.17 |

The calves were weaned at approximately seven months of age, fed for 16 days as a preliminary period, and then full-fed 140 days as a test period. The ration was a mixture containing 60 pounds ground snapped corn, 15 pounds cottonseed meal, and 25 pounds ground Coastal Bermuda grass hay. The calves were scored at the end of the test period according to the S-10 form. This score was converted to a basis of 50 points. The final rating given above was then obtained from the following equation:

$$\text{Rating} = \text{Type score} + \frac{\text{Avg. daily gain}}{.05}$$

A proven bull was again loaned to Mississippi State College and Sire 508 was sold to the University of Tennessee. No new equipment other than minor items was added. No material other than the usual station annual report was published. No publications are planned for the present.

The above report summarizes activities for the Tifton Herds. The report pertaining to the second objective follows:

The grading, crisscrossing, and rotational crossing project is being set up as follows:

| | | Establishing Herds-Percent of Total | | | |
|---|---|---|---|---|---|
| Breeding Herds | Herd Size | 1956 | 1957 | 1958 | 1959 |
| Grade Angus | 40 | 35 | 65 | 80 | 100 |
| Grade Hereford | 40 | 35 | 65 | 80 | 100 |
| Grade Santa Gertrudis | 40 | 25 | 50 | 80 | 100 |
| A x H | 40 | 35 | 65 | 80 | 100 |
| A x S.G. | 40 | 16 | 35 | 55 | 100 |
| H x S.G. | 40 | 25 | 50 | 80 | 100 |
| A x H x S.G. | 60 | 25 | 50 | 72 | 100 |
| A x H | 20 | 30 | 60 | 80 | 100 |
| A x S.G. | 20 | 25 | 40 | 60 | 100 |
| H x S.G. | 20 | 25 | 50 | 80 | 100 |

The present herd at Reidsville has been used to produce foundation animals to establish the above herds. Enough animals have been weaned to complete requirements. The females are added to the herds as two year olds thereby calving first at three years of age. The herds will be completed in 1959 with the addition of the present group of weanling heifers.

Polled Hereford and Angus sires are selected from the Tifton herds. Santa Gertrudis sires are obtained from the West Central Florida Experiment station at Brooksville, Florida. Sires will be used two years only. Cows are randomized within age groups each year to sires. Each year sires are allotted cows from all groups to be bred to that particular breed of sire.

The cows are divided into small groups during breeding season only. Otherwise, they are managed as large groups. The cows are pasture bred from April to July. The calves are weaned at an average age of approximately 7½ months. The calves are scored at weaning.

Data on the first group of calves from birth through weaning are presented in summary form below:

| Herd | No. Born | Calves Weaned | Birth Weight | 210 Day Weight | A.D.G. Birth-Weaning | Weaning Score* Slaughter | Feeder |
|---|---|---|---|---|---|---|---|
| G.A. | 7 | 6 | 61.9 | 350.8 | 1.38 | 8.3 | 10.6 |
| G.H. | 10 | 10 | 64.6 | 325.2 | 1.24 | 7.0 | 9.4 |
| G.S.G. | 8 | 7 | 69.1 | 455.7 | 1.86 | 8.8 | 8.2 |
| A x H | 11 | 11 | 67.4 | 383.0 | 1.52 | 8.4 | 9.9 |
| A x S.G. | 3 | 3 | 64.0 | 413.3 | 1.65 | 8.0 | 8.8 |
| H x S.G. | 9 | 9 | 64.2 | 451.4 | 1.84 | 9.0 | 8.6 |
| H x A x SG | 10 | 10 | 68.7 | 409.1 | 1.61 | 8.9 | 9.5 |

* According to S-10 form.

## IV. Future Plans

Future plans are to continue this project as outlined. No publications will be forthcoming for the next year or so; however, reports for each year will be presented and expanded to furnish more detailed information as quickly as enough records accumulate to justify expansion. Such adjustment factors as sex and age of dam differences will be determined for particular herds rather than for the entire groups.

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED* AFTER WEANING
(or pastured for high gains)

Georgia Coastal Plain Exp. Station

| Line or group designation | Polled Herefords | Angus |
|---|---|---|
| Location | Tifton | |
| Breeding of calves | Polled Herefords | Angus Angus |
| Av. inbreeding (%) | --- | --- |
| Bulls, No. | 44 | 15 |
| Av. inbreeding (%) | -- | -- |
| Av. weaning wt. | 441 | 437 |
| Av. 12 month wt. | 798 | 782 |
| Length of feeding period | 140 days | 140 days |
| Feed per cwt. gain (lbs) | 753 | 859 |
| Concentrates | 560 | 644 |
| Roughage | 193 | 215 |
| Av. daily gain on test | 2.31 | 2.15 |
| **Av. type score (12 months | 11.3 | 11.3 |
| Heifers, No. | 31 | 16 |
| Av. inbreeding (%) | -- | -- |
| Av. weaning wt. | 410 | 401 |
| Av. 12 month wt. | 659 | 642 |
| Length of feeding period | 140 days | 140 days |
| Feed per cwt. gain (lbs) | 877 | 1037 |
| Concentrates | 658 | 778 |
| Roughage | 219 | 259 |
| Av. daily gain on test | 1.79 | 1.56 |
| **Av. type score (12 months) | 11.4 | 11.5 |

* Ration full-fed to all calves was: 60 pounds ground snapped corn, 15 pounds cottonseed meal, and 25 pounds ground Coastal Bermuda grass hay. Ration mixed.

** Scored according to S-10 form.

PERFORMANCE OF COW HERDS. 1957 CALVES

Georgia Coastal Plain Exp. Station

| Line of group designation | P. Here. | Angus | G.Angus | Gr.S.Gert | G.Here. | HxSG criss | HxA criss | AxSG criss | HxA x SG Rotation |
|---|---|---|---|---|---|---|---|---|---|
| Location | Tifton | | Reidsville | | | Reidsville | | | |
| Breed of sire | P.Here. | Angus | .Angus | S.G. | P.Here | H.S.G. | H. A. | A. SG. | all |
| Breed of dam | P.Here. | Angus | G.Angus | Gr.S.G. | G.P.Here | H.S.G. | H.A. | A. SG. | all |
| No. cows bred | 102 | 42 | 14 | 9 | 14 | 9 | 14 | 6 | 14 |
| No. cows calving | 69 | 34 | 7 | 8 | 10 | 9 | 11 | 3 | 10 |
| No. calves raised | 65 | 34 | 6 | 7 | 10 | 9 | 11 | 3 | 10 |
| Av. inbr. of dams (%) | | | | | | | | | |
| Av. birth date | 2/10/57 | 2/9/57 | 2/4/57 | 2/21/57 | 2/17/57 | 2/6/57 | 2/18/57 | 3/5/57 | 2/17/57 |
| Av. birth wt. (lbs) | 64.9 | 63.20 | 61.9 | 69.1 | 64.6 | 64.2 | 67.4 | 64. | 68.7 |
| Bulls | 64.9 | 67.2 | 62.2 | 67.4 | 69.6 | 65.2 | 67.3 | 67. | 71.8 |
| Heifers | 64.9 | 60.0 | 60.0 | 72.0 | 53.0 | 63.2 | 67.7 | 58. | 66.7 |
| Were calves creep fed? | Yes | Yes | No | No | No | No | No | No | No |
| Av. wt. at 210 days (lbs) | 375.2 | 403.3 | 350.8 | 455.7 | 325.2 | 451.4 | 383.0 | 413.3 | 409.1 |
| Bulls | 382.5 | 443.3 | | | | | | | |
| Steers | - | -- | 350.8 | 452.5 | 339.1 | 468.0 | 393.2 | 436.5 | 445.5 |
| Heifers | 369.8 | 369.9 | - | 460.0 | 292.6 | 430.7 | 365.0 | 367.0 | 404.8 |
| Av. weaning date | 9/17/57 | 9/17/57 | 10/10/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/10/57 | 10/9/57 |
| Bulls | " | " | -- | -- | -- | -- | -- | -- | -- |
| Steers | -- | -- | 10/10/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/10/57 | 10/9/57 |
| Heifers | 9/17/57 | 9/17/57 | 10/10/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/9/57 | 10/10/57 | 10/9/57 |
| Av. weaning wt. | 372.9 | 410.4 | 402.5 | 502.1 | 360.0 | 515.1 | 413.4 | 428 | 448.0 |
| Bulls | 380.7 | 451.3 | -- | -- | -- | -- | -- | -- | -- |
| Steers | -- | -- | 402.5 | 506.3 | 378.6 | 530.2 | 427.4 | 430 | 436.2 |
| Heifers | 367.0 | 376.4 | -- | 496.7 | 316.7 | 494.2 | 388.7 | 425 | 455.8 |
| Av. weaning type score | 10.5 | 11.5 | 10.6 | 8.2 | 9.4 | 8.6 | 9.9 | 8.8 | 9.5 |
| Bulls | 10.3 | 11.4 | -- | -- | -- | -- | -- | -- | -- |
| Steers | -- | -- | 10.6 | 8.0 | 9.5 | 8.2 | 10.8 | 7.6 | 10.2 |
| Heifers | 10.7 | 11.7 | -- | 8.5 | 9.0 | 9.0 | 8.8 | 10.6 | 9.1 |
| Av. weaning condition score | 8.6 | 10.1 | 8.3 | 8.8 | 7.0 | 9.0 | 8.4 | 8.0 | |
| Bulls | 8.0 | 9.8 | -- | -- | -- | -- | -- | -- | 8.9 |
| Steers | -- | -- | 8.3 | 8.1 | 6.9 | 8.8 | 8.8 | 7.5 | 8.8 |
| Heifers | 9.2 | 10.5 | -- | 9.5 | 7.3 | 9.4 | 7.7 | 8.8 | 9.0 |

KENTUCKY STATION

-by-

A. R. Parsons and D. G. Steele

I. Project Title:

A performance and progeny testing program for bulls of the beef breeds.

II. Objectives:

To use weaning weights, rate of gain, efficiency of gain, conformation score and condition score of bull calves in an effort to determine the value these items should receive in predicting the future value of bulls in the breeding herd.

III. Accomplishments:

(1) Two 154-day performance tests using a total of 28 bulls have been completed. The data from these tests are presented in tables I and II. The sixth performance test involving sixteen bulls is underway.

(2) Two performance tested bulls, one a slow and one a fast gainer, have been mated on 20 grade Hereford and 20 purebred Red Poll cows. The calves from these cows will be compared as to birth weights, weaning weights, feed lot performance and carcass value.

IV. Future Plans:

(1) Two 154-day performance tests will be conducted each year.

(2) Four bulls from the performance test have been mated on 25 Hereford heifers each and the steer calves are being group fed so that feed lot performance and carcass value may be determined in addition to birth and weaning weights.

(3) A purebred Hereford herd is being established where the entire herd will be placed on a breeding program where all breeding replacements will be selected according to conformation and performance scores.

V. Publications:

Performance Testing of Beef Bulls by A. R. Parsons and D. G. Steel, Annual Livestock Field Day, University of Kentucky Animal Husbandry Mimeo. July 17, 1957.

Table I. September 17, 1956 - February 18, 1957. (154 days)

| Breed & Identification | Initial wt. lbs | Final wt lb | Av.Da. gain lbs | Feed/ cwt. gain | Age at end of test, days | Wt. for age* | Ave. Score Conformation ** Initial | Final | Ave. Score Condition *** Initial | Final | Breeder |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Shorthorn 1-46 | 578 | 1008 | 2.79 | 733.7 | 410 | 2.46 | 3.5 | 3.0 | Good | Choice | Brown-Forman, Frankfort |
| P.Here. 2-47 | 468 | 858 | 2.53 | 735.0 | 386 | 2.22 | 5.3 | 4.5 | Standard | Good | Brownell, Combs, Lexington, Ky. |
| Angus 3-48 | 525 | 852 | 2.12 | 811.9 | 396 | 2.15 | 4.7 | 4.8 | Good- | Good+ | Ward Renaker, Cynthiana |
| Angus 4-49 | 595 | 955 | 2.34 | 857.2 | 418 | 2.28 | 5.1 | 4.1 | Good | Choice- | J.H.Quisenberry & Sons Winchester |
| Hereford 5-50 | 436 | 735 | 1.94 | 888.0 | 357 | 2.06 | 6.1 | 7.5 | Standard | Good- | S.V.Perkins, Harrodsburg |
| P.Shortho. 6-51 | 518 | 975 | 2.97 | 831.2 | 492 | 1.98 | 4.8 | 4.1 | Standard+ | Choice | Thos. Piatt, Lexington |
| Shorthorn 7-52 | 498 | 922 | 2.75 | 769.5 | 440 | 2.10 | 6.1 | 5.3 | Standard+ | Good+ | Henry Knight, Lexington |
| Shorthorn 8-53 | 447 | 830 | 2.49 | 830.4 | 389 | 2.13 | 7.3 | 6.1 | Standard | Good | Richard Holt, Versaille |
| Shorthorn 9-54 | 595 | 1135 | 3.51 | 703.8 | 543 | 2.09 | 5.0 | 3.7 | Good+ | Choice+ | Thos. Piatt, Lexington |
| P.Here. 11-56 | 505 | 847 | 2.22 | 827.6 | 390 | 2.17 | 4.3 | 3.6 | Good | Choice- | Brownell Combs, Lexington |
| Hereford 12-57 | 500 | 892 | 2.55 | 748.6 | 373 | 2.40 | 5.0 | 5.3 | Good | Good+ | J.B.& Joe McCord, Winchester |
| Hereford 13-58 | 575 | 1010 | 2.83 | 724.1 | 434 | 2.32 | 7.1 | 5.1 | Good- | Good+ | J.B.& Joe McCord, Winchester |
| Hereford 14-59 | 510 | 858 | 2.26 | 708.9 | 366 | 2.34 | 7.5 | 6.1 | Standard | Good | J. B. & Joe McCord, Winchester |
| Hereford 15-60 | 758 | 1137 | 2.46 | 877.7 | 498 | 2.28 | 3.0 | 2.5 | Good+ | Choice+ | Roy Ragland, Hodgensville |
| Angus 16-61 | 448 | 730 | 1.83 | 880.1 | 339 | 2.15 | 4.8 | 6.5 | Standard+ | Good- | R. W. Taul, Paris |
| AVERAGE | 530 | 916 | 2.51 | 800.5 | 415 | 2.21 | 5.3 | 4.8 | Good+ | Good+ | |

* Final weight divided by age (days).
** Scored from 1 to 9 with 1 indicating most desirable conformation.
*** This score indicates degree of finish determined by slaughter grade standards.

Table II

BULL PERFORMANCE
March 18, - August 19, 1957

| Bull No. | Breed | Av initial wt lbs | Av. final wt. lbs. | Total gain lbs | Av daily gain lbs | Total feed consume lbs | Feed required per cwt gain, lbs | Average score* Conformation Initial | Conformation Final | Condition* Initial | Condition* Final | Breeders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-62 | Shorthorn | 388 | 745 | 357 | 2.32 | 3009.5 | 843 | 12.4 | 14.0 | 8.8 | 10.3 | Henry Knight, Lexington, Ky. |
| 2-63 | P.Here. | 588 | 1165 | 577 | 3.75 | 4054.5 | 703 | 8.8 | 11.0 | 9.2 | 13.3 | Melvin Sams, Shelbyville, Ky. |
| 3-64 | P.Here. | 500 | 910 | 410 | 2.66 | 3323.5 | 811 | 7.0 | 7.3 | 6.8 | 9.3 | Sam Houchens, Chaplin, Ky. |
| 4-65 | Hereford | 735 | 1093 | 358 | 2.32 | 2770.0 | 774 | 11.4 | 12.3 | 10.8 | 12.0 | Adolph Rupp & Son Lexington, Ky. |
| 5-66 | P.Here. | 847 | 1218 | 371 | 2.41 | 3411.0 | 919 | 13.0 | 13.7 | 12.4 | 15.7 | C.B.&J.R. McCord Winchester, Ky. |
| 6-67 | Shorthorn | 648 | 995 | 347 | 2.25 | 3175.0 | 915 | 12.6 | 14.3 | 10.4 | 13.0 | Henry Knight Lexington, Ky. |
| 7-68 | Shorthorn | 920 | 1230 | 310 | 2.01 | 3727.0 | 1202 | 9.6 | 12.0 | 11.6 | 13.3 | Spears Farming Co. Paris, Ky. |
| 8-69 | Shorthorn | 770 | 1137 | 367 | 2.38 | 3663.5 | 998 | 9.2 | 10.3 | 9.6 | 13.3 | Spears Farming Co. Paris, Ky. |
| 9-70 | P.Here. | 577 | 1023 | 446 | 2.90 | 3199.5 | 717 | 8.6 | 9.7 | 8.8 | 13.0 | H. W. Jones Bardstown, Ky. |
| 10-71 | Hereford | 765 | 1098 | 333 | 2.16 | 3065.5 | 921 | 11.8 | 12.3 | 10.8 | 13.0 | J. D. Gay Pine Grove, Ky. |
| 12-73 | Hereford | 568 | 1007 | 439 | 2.85 | 3118.5 | 710 | 10.4 | 12.3 | 9.4 | 11.3 | Gatton Bros. Bremen, Ky. |
| 13-74 | Hereford | 647 | 1070 | 423 | 2.75 | 3700.5 | 875 | 8.0 | 10.0 | 8.8 | 11.3 | Walter Ruby, Madisonville, Ky. |
| 14-75 | P.Here. | 825 | 1108 | 283 | 1.84 | 3014.0 | 1065 | 11.2 | 11.7 | 11.0 | 11.7 | Brownell Combs, Lexington, Ky. |
| AVERAGE | | 675 | 1061 | 386 | 2.51 | 3325.5 | | | | | | |

17 = High Prime or Fancy; 16 = Average; 15 = Low; 14 = High Choice; 13 = Average Choice; 12 = Low Choice; 11 = High Good; 10 = Average Good; 9 = Low Good.

LOUISIANA STATION
-by-
R. A. Damon, Jr.

I. Project Title: La. 605.

Comparisons of Various Crossbred Cattle Under Gulf Coast Conditions With Respect to Rate of Growth on Pasture, Fattening Ability and Meat Quality of Steers.

II. Objectives:

(a) To develop types of beef cattle best suited to conditions along the Gulf Coast.

(b) To compare the performance of several breeds of beef cattle and crosses between these breeds with respect to rate of growth on pasture, fattening ability, and meat quality of steers.

(c) To estimate the amount of hybrid vigor that can be expected to result from crossing beef breeds and to ascertain the methods best suited for its utilization and maintenance.

III. Accomplishments During the Year:

(a) The last group of calves to be produced in the first phase of this project was raised during this year. A total of 137 calves were weaned on October 17, 1957, making a total of 597 calves weaned since this experiment was initiated. The data collected on the last group of calves are presented in the accompanying tables. The weaning weights have been adjusted to 180 days of age and also adjusted for the age of dam and sex of calf. To present the data for the 24 different types of cattle produced in this project would result in a report too voluminous, so the calves have been grouped according to breed of the sire in one table and breed of dam in a second table. The performance of the different groups will be presented in a publication summarizing the first five years of this work.

The data show that the Brangus cows have raised heavier calves than have the three other breeds of cows used in this study. The Brahman cows do not show the superiority over the Angus and Hereford cows in weaning weights that they have in the past.

The Charolaise and Hereford bulls sired the heavier weaning calves as they have in the past. The Shorthorn bull sired unusually light calves, and these weights are not at all consistent with previous weights of Shorthorn calves. The calves sired by the Brangus bull were noticeably heavier than they have been in previous years.

(b) All the females produced in this project have been retained for further breeding studies in connection with this crossbreeding experiment. At the present time 179 females have reached the

age of 2½ years. The data have shown that females out of Brahman cows have consistently had a greater post-weaning rate of growth than have the females out of the other breeds of cows. The heifers out of Brangus cows have consistently shown a greater rate of growth than those out of Angus and Hereford cows. The data also show that females sired by Charolaise bulls have a greater post-weaning rate of gain than do females sired by the five other breeds of sires used in this study. The females sired by Hereford and Shorthorn bulls rank second and third, respectively, in this trait.

(c) The 54 steers produced in this experiment in 1956 were retained and fed out on a wheat and rye grasspasture with a grain supplement. The supplement was composed of a 6:1 ration of corn and cottonseed meal, and the steers consumed an average of 7½ pounds daily. The feeding period was 168 days during which time the steers made an average rate of gain of 1.79 pounds daily.

At the end of the feeding period the steers were slaughtered in the University's meats laboratory, where many detailed carcass measurements were collected. A few of the carcass data are presented in the accompanying table.

(d) The second phase of this program is a backcross breeding program, using the crossbred females produced in the first phase. The backcross breeding was started in the spring of 1957 and the first crop of calves will be dropped in the spring of 1958.

(e) The study of the inheritance and effects of the muscular hypertrophy or "double-muscling" condition is continuing with considerable detailed carcass information being collected in order to have a more objective evaluation of this condition.

IV. Future Plans:

The conclusion of the first phase of this experiment has released the females used in this project for other studies. An experiment is being initiated with a primary objective of examining the possibility of selecting rapid gaining bulls prior to weaning, rather than by the post-weaning feeding trials that are presently being used. The calves to be used on this project will be dropped in the spring of 1958.

V. Publications:

Damon, R. A. Jr., Crossbred Beef Cattle in the Gulf Coast Region. Paper presented at the American Society of Animal Production meetings, Chicago, Illinois, November 29, 1957.

POSTWEANING PERFORMANCE OF 1956 STEER CALVES

Fed on Pasture and Concentrate Supplement

Baton Rouge - Louisiana Station

168 days

| | Angus Crossbreds | Brahman Crossbred | Brangus Crossbred | Charolaise Crossbred | Hereford Crossbred | Shorthorn Crossbreds |
|---|---|---|---|---|---|---|
| No. Steers | 13 | 10 | 6 | 6 | 8 | 11 |
| Feeder Grade[1] | 12.03 | 12.77 | 11.39 | 13.06 | 13.96 | 12.86 |
| Slaughter Calf Grade[2] | 9.92 | 10.53 | 10.11 | 10.67 | 11.96 | 10.91 |
| Slaughter Grade[2] | 11.42 | 11.08 | 11.33 | 9.96 | 12.03 | 11.69 |
| Av. Daily Gain on Feed | 1.81 | 1.72 | 1.93 | 1.76 | 1.69 | 1.79 |
| Carcass Grade[2] | 10.13 | 10.42 | 9.71 | 8.75 | 10.84 | 10.42 |
| Hot Dressing Percentage | 58.64 | 60.62 | 59.39 | 59.50 | 60.20 | 59.72 |
| Chilled Dressing Percentage | 57.86 | 59.91 | 57.93 | 58.65 | 59.40 | 58.89 |
| Planimeter Area Eye of Lean | 8.43 | 8.06 | 9.41 | 8.52 | 8.39 | 8.54 |
| Shearing Strength Tenderness | 11.02 | 14.96 | 11.24 | 10.26 | 11.55 | 11.84 |

[1] Common 3-5, Medium 6-8, Good 9-11, Choice 12-14, Fancy 15-17.

[2] Utility 3-5, Commercial 6-8, Good 9-11, Choice 12-14, Prime 15-17.

PERFORMANCE OF COW HERDS. 1957 CALVES

Baton Rouge, Louisiana Station

| Line of group designation<br>Location | Baton Rouge | | | | | |
|---|---|---|---|---|---|---|
| Breed of sire *<br>Breed of dam | Angus | Brahman | Brangus | Charolaise | Here. | Shorthorn |
| No. cows bred | 32 | 32 | 32 | 32 | 32 | 32 |
| No. cows calving | 23 | 23 | 26 | 23 | 23 | 27 |
| No. calves raised | 23 | 19 | 23 | 23 | 23 | 26 |
| Av. birth date | 2/9/57 | 2/17/57 | 2/28/57 | 3/3/57 | 2/7/57 | 2/28/57 |
| Av. birth wt. (lbs) | 57.7 | 67.0 | 67.3 | 76.5 | 70.0 | 71.0 |
| Bulls | 55.9 | 71.4 | 64.8 | 76.9 | 69.6 | 74.5 |
| Heifers | 59.1 | 63.6 | 68.6 | 76.3 | 70.4 | 66.7 |
| Were calves creep fed? | No | No | No | No | No | No |
| Av. wt. at six months (lbs) | 394.0 | 407.5 | 421.3 | 429.5 | 432.3 | 378.3 |
| Steers | 377.1 | 403.1 | 378.7 | 413.6 | 445.0 | 370.9 |
| Heifers | 407.1 | 410.7 | 448.8 | 439.8 | 420.7 | 386.9 |
| Av. weaning date: | 10/17/57 | | | | | 10/17/57 |
| Av. weaning wt. | 426.7 | 443.4 | 432.4 | 443.3 | 470.0 | 394.8 |
| Steers | 409.5 | 456.9 | 403.9 | 443.3 | 510.0 | 402.5 |
| Heifers | 440.0 | 433.6 | 450.7 | 443.2 | 433.3 | 385.8 |
| Av. weaning type score | | | | | | |
| Heifers | L-Ch | L-Ch | H-Good | H-Good | L-Ch | H-Good |
| Av. weaning condition score | H-Good | H-Good | Good | Good | H-Good | L-Good |
| Steers | Good | Good | H-Com | Good | H-Good | L-Good |
| Heifers | H-Good | L-Ch | H-Good | Good | H-Good | Good |
| Calves slaughtered at weaning: | NONE | | | | | |

* Each breed of sire was mated to the 4 breeds of dams shown in the above table but breed of dam was ignored in grouping the data for this table.

PERFORMANCE OF COW HERDS. 1957 CALVES

Baton Rouge, Louisiana Station

| Line of group designation<br>Location<br>Breed of sire<br>Breed of dam*<br>No. cows bred | Baton Rouge<br>Brangus<br>48 | Baton Rouge<br>Angus<br>48 | Baton Rouge<br>Hereford<br>48 | Baton Rouge<br>Brahman<br>48 |
|---|---|---|---|---|
| No. cows calving | 39 | 38 | 30 | 38 |
| No. calves raised | 39 | 35 | 28 | 35 |
| Av. birth date | 2/18/57 | 2/10/57 | 2/26/57 | 2/28/57 |
| Av. birth wt. (lbs) | 70.4 | 67.4 | 72.6 | 63.7 |
| Bulls | 71.1 | 70.1 | 71.7 | 64.3 |
| Heifers | 69.9 | 65.8 | 73.3 | 63.1 |
| Were calves creep fed? | No | No | No | No |
| Av. wt. at six months (lbs) | 424.3 | 405.4 | 402.8 | 403.9 |
| Steers | 410.4 | 402.4 | 376.8 | 395.2 |
| Heifers | 434.0 | 407.4 | 425.3 | 413.2 |
| Av. weaning date | 10/17/57 | 10/17/57 | 10/17/57 | 10/17/57 |
| Steers | " | " | " | " |
| Heifers | " | " | " | " |
| Av. weaning wt: | 455.5 | 427.7 | 398.4 | 444.7 |
| Steers | 460.6 | 439.6 | 370.8 | 459.7 |
| Heifers | 452.0 | 419.8 | 422.3 | 428.8 |
| Av. weaning type score<br>Heifers | H-Good | L-Choice | H-Good | H-Good |
| Av. weaning condition score | Good | H-Good | Good | H-Good |
| Steers | L-Good | Good | L-Good | Good |
| Heifers | H-Good | H-Good | H-Good | H-Good |
| Calves slaughtered at weaning | NONE | | | |

* Dams of the same breed were divided into six sub-groups and mated to the sires shown in the previous table but these data ignored the breed of sire.

# PERFORMANCE OF COW HERDS. 1957 CALVES

Iberia Station
Jeanerette, Louisiana

| Line of group designation | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 1 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | JEANERETTE, LOUISIANA | | | | | | | | | | | | |
| Breed of sire | BxA | BxA | BxA | BxA | BxA | BxA | AfxA | AfxA | AfxA | AfxA | Bra | Bra | A.Ang. |
| Breed of dam | BxA | BxA | BxA | BxA | BxA | BxA | AfxA | AfxA | AfxA | AfxA | Bra | Bra | A.Ang. |
| No. cows bred | 25 | 23 | 19 | 17 | 26 | 23 | 12 | 15 | 18 | 14 | 13 | 22 | |
| No. cows calving | 20 | 16 | 8 | 10 | 18 | 11 | 9 | 8 | 16 | 13 | 11 | 17 | IN- |
| No. calves raised | 17 | 14 | 8 | 10 | 17 | 10 | 8 | 7 | 16 | 13 | 10 | 16 | complete |
| Av. inbr of dams (%) | 5.00 | 5.01 | 3.19 | 2.23 | 4.78 | 4.16 | 9.88 | 7.48 | 8.81 | 10.04 | 1.33 | -- | |
| Av. inbr of calves (%) | Not available | | | | Not available | | | Not available | | | Not available | | |
| Av. birth date | 2/2/57 | 2/13 | 3/2 | 2/11 | 1/29 | 3/4 | 2/3 | 2/7 | 1/29 | 1/23 | 1/23 | 2/13 | |
| Av. birth wt. (lbs) | | | | | | | | | | | | | |
| Bulls | 57.8 | 76.0 | 84.0 | 74.4 | 61.1 | 68.4 | 66.0 | 64.4 | 61.4 | 60.0 | 52.2 | 56.2 | |
| Heifers | 53.1 | 72.6 | 88.0 | 66.0 | 59.1 | 59.7 | 60.2 | 55.0 | 50.3 | 61.4 | 57.3 | 58.2 | |
| Were calves creep fed? | No | No | No | No | No | No | No | No | No | No | No | No | |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | | | |
| Bulls | 394.0 | 451.8 | 441.0 | 456.0 | 459.6 | | 472.0 | 448.0 | 397.2 | 456.0 | | 434.5 | |
| Steers | 390.0 | 374.0 | 409.0 | 426.5 | 434.0 | 338.0 | 392.3 | 365.0 | 355.5 | 336.5 | 336.8 | 331.3 | |
| Heifers | 361.1 | 400.8 | 402.0 | 393.0 | 394.2 | 356.8 | 357.0 | 314.0 | 294.3 | 340.5 | 276.5 | 348.0 | |
| Av. weaning date: | OCTOBER 2, 1957 | | | | | | | | | | | | |
| Av. weaning wt: | | | | | | | | | | | | | |
| Bulls | 448.3 | 485.0 | 471.2 | 496.7 | 525.0 | | 495.0 | 515.0 | 445.0 | 477.5 | | 480.0 | |
| Steers | 446.0 | 475.0 | 430.0 | 467.5 | 530.0 | 357.0 | 435.0 | 395.0 | 405.0 | 390.0 | 426.2 | 367.5 | |
| Heifers | 410.0 | 450.6 | 485.0 | 437.0 | 469.4 | 384.0 | 410.0 | 305.0 | 344.3 | 383.3 | 330.8 | 414.4 | |
| Av. weaning type score: | | | | | | | | | | | | | |
| Bulls | 9.8 | 10.7 | 9.6 | 9.7 | 10.4 | | 8.3 | 9.5 | 9.9 | 9.2 | | 9.8 | |
| Steers | 7.7 | 9.0 | 8.0 | 8.8 | 8.0 | 7.5 | 7.9 | 7.0 | 8.4 | 8.8 | 10.2 | 8.2 | |
| Heifers | 9.2 | 11.1 | 10.8 | 10.5 | 9.2 | 9.2 | 8.4 | 7.5 | 7.1 | 7.7 | 7.5 | 9.2 | |
| Av. weaning condition score: | | | | | | | | | | | | | |
| Bulls | 8.1 | 9.5 | 7.2 | 8.7 | 9.0 | | 6.0 | 8.0 | 8.3 | 8.5 | | 8.3 | |
| Steers | 7.4 | 8.3 | 6.6 | 7.3 | 8.3 | 7.3 | 7.4 | 6.6 | 8.1 | 8.0 | 9.1 | 7.6 | |
| Heifers | 8.6 | 10.1 | 8.8 | 9.6 | 8.3 | 9.0 | 8.3 | 6.0 | 7.0 | 7.6 | 7.0 | 8.1 | |
| Calves slaughtered at weaning | NONE | | | | | | | | | | | | |

Con't. -- POST-WEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Iberia Station
Jeanerette, Louisiana

| Line or group designation | 3 | 4 | 1 | 2 | | |
|---|---|---|---|---|---|---|
| Location | JEANERETTE, LOUISIANA | | | | | |
| Breeding of calves | AfxA | AfxA | Brahman | Brahman A. Angus Sindhi Crossbred | | |
| Av. inbreeding (%) | 7.28 | 10.03 | | | | |
| **Bulls**, No. | 1 | 1 | 1 | 0 | 1 | 1 |
| Av. inbreeding (%) | 4.69 | 10.16 | | | | |
| Av. weaning wt. | 470.0 | 545.0 | 520.0 | | 480.0 | 315.0 |
| Av. 12 month wt. | 750.0 | 830.0 | 835.0 | | 810.0 | 535.0 |
| Length feeding period | 154 days | 154 | 154 | | 154 | 154 |
| Feed per cwt. gain (lbs) | | | | | | |
| Concentrates | 662.32 | 635.96 | 513.69 | | 539.74 | 514.01 |
| Roughage | 360.89 | 350.35 | 287.22 | | 297.09 | 275.08 |
| Av. daily gain on test | 1.82 | 1.85 | 2.05 | | 2.14 | 1.43 |
| Av. type score (12 mos) | 12.3 | 10.3 | 13.3 | | 12.3 | 9.3 |
| **Steers**, No. | 5 | 2 | 2 | 6 | 3 | 0 |
| Av. inbreeding (%) | 7.80 | 9.96 | | | | |
| Av. weaning wt. | 435.0 | 427.0 | 345.0 | 378.3 | 356.7 | |
| Av. 12 month wt. | 703.0 | 709.0 | 625.0 | 633.3 | 646.7 | |
| Length feeding period | 154 | 154 | 154 | 154 | 154 | |
| Feed per cwt gain (lbs) | Lot fed | Lot fed | | | | |
| Av. daily gain on test | 1.74 | 1.77 | 1.86 | 1.68 | 1.88 | |
| Av. type score (12 mos) | 12.1 | 12.8 | 10.2 | 9.8 | 11.9 | |
| **Heifers**, No. | None | None | None | None | None | None |

# POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Iberia Station
Jeanerette, Louisiana

| Line or group designation | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
|---|---|---|---|---|---|---|---|---|
| Location | JEANERETTE, LOUISIANA | | | | | | | |
| Breeding of calves | BxA | BxA | BxA | BxA | BxA | BxA | AfxA | AfxA |
| Av. inbreeding (%) | 7.30 | 6.13 | 7.48 | 8.46 | 8.23 | 6.91 | 15.23 | 11.01 |
| **Bulls, No.** | 1 | 5 | 4 | 2 | 4 | 2 | 0 | 2 |
| Av. inbreeding (%) | 0.78 | 6.95 | 8.16 | 7.22 | 8.03 | 3.51 | | 10.74 |
| Av. weaning wt. | 510.0 | 519.0 | 557.5 | 605.0 | 563.8 | 532.5 | | 505.0 |
| Av. 12 month wt. | 795.0 | 868.0 | 898.8 | 805.0 | 908.8 | 897.5 | | 745.0 |
| Length feeding period | 154 days | 154 | 154 | 154 | 154 | 154 | | 154 |
| Feed per cwt gain (lbs) | | | | | | | | |
| Concentrates | 559.88 | 502.58/1 | 546.06/2 | 988.28/3 | 563.25/2 | 499.94 | | 637.51 |
| Roughage | 312.39 | 278.80/1 | 303.34/2 | 536.55/3 | 313.07/2 | 270.05 | | 361.71 |
| Av. daily gain on test | 1.85 | 2.27 | 2.22 | 1.62 | 2.24 | 2.30 | | 1.90 |
| Av. type score (12 mos) | 9.3 | 12.2 | 11.8 | 10.3 | 13.2 | 10.6 | | 13.0 |
| **Steers, No.** | 5 | 5 | 7 | 7 | 3 | 8 | 1 | 8 |
| Av. inbreeding (%) | 8.61 | 5.31 | 7.09 | 8.82 | 8.49 | 7.76 | 15.23 | 11.08 |
| Av. weaning wt. | 394.0 | 490.0 | 476.4 | 452.9 | 456.7 | 470.0 | 460.0 | 451.9 |
| Av. 12 month wt. | 645.0 | 745.0 | 702.9 | 702.9 | 720.0 | 720.0 | 770.0 | 718.8 |
| Length feeding period | 154 days | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
| Feed per cwt. gain (lbs) | | | | | | | | |
| Concentrates | Lot fed | Lot fed | Lot fed | Lot fed | Lot fed | Lot fed | Lot fed | Lot fed |
| Av. daily gain on test | 1.63 | 1.66 | 1.47 | 1.62 | 1.71 | 1.62 | 2.01 | 1.73 |
| Av. type score (12 mos) | 12.0 | 11.5 | 11.1 | 10.8 | 11.2 | 10.7 | 12.7 | 10.4 |

/1 - Ave. of 3 bulls fed individually - 2 were lot fed.
/2 - Ave. of 3 bulls fed individually - 1 was lot fed.
/3 - Ave. of 1 bull fed individually - 1 was lot fed.

MARYLAND STATION

I. Project Title: C-14. A Study of Productiveness of Purebred Beef Cattle in Maryland.

II. Objectives:

(1) To study productiveness of existing or introduced stocks of beef cattle. Productive characteristics measured will include rate of gain, economy of gain, market type, carcass quality, fertility, longevity, adaptation to environmental conditions, and other factors affecting the utility value of beef cattle.

(2) To compare selective criteria (individual and pedigree) with actual performance of progeny.

(3) To evaluate breeding techniques for small purebred herds under the varying conditions encountered in practice in purebred herds.

(4) To attempt to produce beef cattle with superior productive capacities by line breeding and selection. (Using criteria of selection as developed in this project and by cooperating stations in this and other regions).

III. Accomplishments During the Year:

Routine weights and linear measurements as requested by the S-10 Committee have been secured on the Aberdeen-Angus and Hereford herds owned by the University of Maryland on the same basis as reported previously.

Cooperative work involving the weighing of calves was continued with the manager of an Aberdeen-Angus herd. The following numbers of bull calves were placed on gain-test trials on the dates indicated: 20, January 5, 1956; 2, Jan. 14, 1956; 5, April 12, 1956; 42, Aug. 22, 1956; and 9, Oct. 25, 1956. All bull calves were placed on 154 day trials. Where time has permitted, all calves have completed their trials. A total of 51 heifer and 58 bull calves were weighed at the time of weaning during the past year. Analyses have not been made of the data recorded during the past year.

IV. Future Plans:

Routine weights and linear measurements will be taken of the animals of the Aberdeen-Angus and Hereford herds owned by the University of Maryland. Cooperative work will be continued with the owner of the herd mentioned above. Additional cooperators will be added to the project if contributions to the project are forseen. No special analyses of the data are contemplated at this time.

V. Publications During the Year:

No formal papers have been prepared during the past year. Weights, gains, etc., have been prepared by the manager of the above mentioned herd and the results have been distributed by him.

VI. Publications Planned:

None.

I. Project Title: C-14-a, Sub-Project

Effect of Early Weaning on the Duration of Maternal Influences in Beef Calves.

II. Objectives:

(1) To attempt to develop a new technique for an earlier evaluation of feed lot performance, progeny testing, and genetic evaluation of beef animals.

(2) To develop sound feeding and management practices for early weaned beef calves.

(3) To evaluate the calves' genetic ability to thrive under new systems of care.

III. Accomplishments During the Year:

Continuation of the work mentioned in the latter portion of the second paragraph of last year's report indicated that there was no statistically significant differences between the multiple regressions of the steers and heifers weaned at 90 days at any of the ten 28-day feeding periods or for the age intervals of 90 to 202 or 202 to 370 days of age. It was also found that no statistically significant differences among the regressions of the combined data of both sexes weaned at either weaning age existed at any of the 28-day feeding periods from 202 days of age to the end of the trial. No statistically significant difference among the regressions was found for the inclusive period of 202 to 370 days of age.

Additional studies have been made using the methods published by Winchester and Hendricks (U.S.D.A. Tech. Bul. 1071). Previous reference to this work was made in the annual reports for the years 1953, 1954, and 1955. The data were re-analyzed by means of multiple regression techniques. Justification was found for the combining of the data of the steers and heifers weaned at 90 days of age for all of the 28-day feeding periods as well as the longer periods of 90 to 202 and 202 to 370 days of age with the exception of the 28-day feeding period from 314 to 342 days of age. In addition, no statistically significant differences among the regressions of the steers or heifers weaned at either weaning age existed for any of the six 28-day feeding periods from the age of 202 days to the end of the trial or for the longer period of 202 to 370 days of age. Results based on the combined data were similar to those reported in previous years in that the power of body weight associated with maintenance was near to 0.4 for the younger calves and tended to increase as the calves became older. Powers of over 1.00 were found after the calves reached an age of 258 days.

Additional work was done on the same data as used in connection with the results reported for the years 1953, 1954, and 1955. These data were secured from both Aberdeen-Angus and Hereford steers and heifers weaned at either 90 or 180 days of age in contrast with the data used for the results given in the above paragraph where the data were based only on Aberdeen-Angus calves. Computations of estimates of TDN intake

associated with gain and average weight gave further indications that the data fit closer to a rectilinear regression system than to a curvilinear regression system. Other minor analyses were made prior to the preparation of a manuscript.

Work has been initiated on the calculation of rectilinear (simple) and quadratic regressions involving gains made during the various feeding periods and the weight at the start of each period and the month of birth of the calf and the age of the dam at calving. Statistically significant rectilinear and quadratic equations involving the weight of the calves at the start of a feeding period and the age of the dams were found for the 28-day feeding periods starting at 90 days of age and ending at 258 days of age relative to the data of the Aberdeen-Angus females weaned at 90 days of age. Non-significant regression coefficients were found after 258 days of age.

IV. Future Plans:

Work will be continued on the analysis of the data and manuscripts will be prepared as soon as possible.

V. Publications During the Year:

Green, W. W., W. J. Corbett and J. Buric. Requirements for growth and maintenance of beef calves. Manuscript prepared and submitted for publication.

VI. Publications Planned:

Publications will be prepared as rapidly as studies on the data permit.

I. Project Title: Sub-Project C-14-b

Type Classification As An Aid In Selection Of Beef Breeding Cattle.

II. Objective:

To determine the value of type classification in beef cattle, i.e., heritability of beef type and production.

III. Accomplishments During the Year:

The Aberdeen-Angus and Hereford herds of the University of Maryland were classified twice during the year by the use of the new scoring system which was described in a previous report. No further analysis of the data has been initiated during the past year.

IV. Future Plans:

The Aberdeen-Angus and Hereford herds of the University of Maryland will be scored semi-annually as in the past.

V. Publications During the Year: None.

VI. Publications Planned: None.

I. Project Title: Sub-Project C-14-d.

Group Versus Individual Feeding of Weaned Beef Calves.

II. Objectives:

(1) To evaluate the accuracy of group vs. individually fed calves as a technique in the testing of sire-progeny groups.

(2) To study the possibility of forecasting the productiveness of beef calves by using single or combined measurements taken on live animals.

(3) To study the value of scores taken on live animals in relation to forecasting their performance.

(4) To compare measurements and scores in order to search for objective methods of determining scores.

(5) To study absolute and relative changes in measurements and scores from one age to another.

III. Accomplishments During the Year:

The 22 Aberdeen-Angus and 26 Hereford calves which were placed on trial October 9, 1956, completed their trial on May 21, 1957. All animals were measured when one year of age and were also measured and scored at the completion of the trial.

On October 8, 1957, 24 Aberdeen-Angus and 23 Hereford calves (steers and heifers) of the 1957 calf crop were weaned and started on the feeding trial. The method of allotting these calves and methods for their feeding and management were the same as used last year. All calves were scored by a committee of three scorers a few days after being placed on trial and were also measured shortly thereafter. Analyses of the data have not been undertaken.

V. Future Plans:

The calves now on trial will be measured a second time when they are one year of age. They will also be measured and scored at the termination of the trial in May 1958. Analysis of the data will be completed as soon as possible after the 1957 calves have completed their trial.

V. Publications During the Year:

None.

VI. Publications Planned:

Manuscripts will be prepared as rapidly as the analysis of the data will permit.

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

University of Maryland Station

| Line or group designation | University of Md. | | University of Md. | |
|---|---|---|---|---|
| Location | University of Md. | | University of Md. | |
| Breeding of calves | Aberdeen Angus | | Hereford | |
| Av. inbreeding (%) | Outbred | Herd | Outbred | Herd |
| Bulls, No. | None | | None | |
| | Indiv. | Group | Indiv. | Group |
| Steers, No. | Fed - 6 | Fed - 5 | Fed - 9 | Fed - 8 |
| Av. inbreeding (%) | Outbred | Herd | Outbred | Herd |
| Av. weaning wt. | 456 | 441 | 449 | 465 |
| Av. 15 month wt. | 875 | 906 | 836 | 898 |
| Length of feeding period | 224 | 224 | 224 | 224 |
| Feed per cwt gain (lbs) | 763 | 822 | 774 | 819 |
| Concentrates | 563 | 535 | 551 | 527 |
| Roughage | 200 | 287 | 223 | 292 |
| Av. daily gain on test | 1.87 | 2.08 | 1.73 | 1.93 |
| Av. type score 15 months | 11 | 11 | 13 | 12 |
| Heifers, No. | 3 | 6 | 5 | 4 |
| Av. inbreeding (%) | Outbred | Herd | Outbred | Herd |
| Av. weaning wt. | 425 | 448 | 466 | 501 |
| Av. 12 month wt. | 768 | 816 | 825 | 890 |
| Length of feeding period | 224 | 224 | 224 | 224 |
| Feed per cwt. gain (lbs) | 900 | 958 | 854 | 933 |
| Concentrates | 625 | 621 | 587 | 608 |
| Roughage | 275 | 337 | 267 | 325 |
| Av. daily gain on test | 1.53 | 1.64 | 1.60 | 1.74 |
| Av. type score 15 months | 11 | 10 | 12 | 11 |

# PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE NOT INCLUDED IN BREEDING HERDS IN 1957

University of Maryland Station

| Line or group designation | Univ. Md. | Univ. Md. |
|---|---|---|
| Breeding: | Angus | Hereford |
| Sex: | Heifers to be | added to herd |
| No. | 6 | 5 |
| Av. age (fall 1956) 11/6 | 21 mo. | 20 mo. |
| Av. wt. (fall 1956) 11/6 | 909 | 913 |
| Av. winter gain | 92 | 133 |
| Days on pasture (1957) | 164 | 164 |
| Av. gain on pasture | 13* | 28* |

Above heifers were selected to go back into breeding herd and were fed for development rather than finish. From October 16, 1956 to April 27, 1957 wintered on approximately full feed of roughage (silage and hay) and six pounds of concentrates per head daily.

* Grazed on permanent pasture from April 27 to October 8 but due to extreme drouth silage and hay were fed from July 13 to October 12.

# PERFORMANCE OF COW HERDS. 1957 CALVES

University of Maryland Station

| Line of group designation | Univ. Md. | Univ. Md. |
|---|---|---|
| Location | Univ. Md. | Univ. Md. |
| Breed of sire | Angus | Hereford |
| Breed of dam | Angus | Hereford |
| No. cows bred | 30 | 30 |
| No. cows calving | 30 | 26 |
| No. calves raised | 25 | 25 |
| Av. inbr of dams (%) | Outbred herd | Outbred herd |
| Av. inbr. of calves (%) | Outbred herd | Outbred herd |
| Av. birth date | 1/23/57 | 3/12/57 |
| Av. birth wt. (lbs) | | |
| Bulls | 63 | 71 |
| Heifers | 58 | 68 |
| Were calves creep fed? | Yes | Yes |
| Av. wt. at six months (lbs) | | |
| Bulls | 345 | 490 |
| Steers | 423 | 413 |
| Heifers | 374 | 388 |
| Av. weaning date: | | |
| Bulls | 10/8/57 | 10/8/57 |
| Steers | 10/8/57 | 10/8/57 |
| Heifers | 10/8/57 | 10/8/57 |
| Av. weaning wt.: | | |
| Bulls | 560 | 525 |
| Steers | 540 | 465 |
| Heifers | 495 | 426 |
| Av. weaning type score: | | |
| Bulls | 8 | 6 |
| Heifers | 9 | 10 |
| Steers | 10 | 10 |
| Av. weaning condition score: | | |
| Bulls | 10 | 10 |
| Steers | 9 | 10 |
| Heifers | 10 | 10 |
| Calves slaughtered at weaning: | None | None |

# MISSISSIPPI STATION

--by--

J. C. Taylor, C. E. Lindley and B. G. Ruffin

## I. Project Title:

A Study to Determine the Breeding Worth of Inbred and Outbred Bulls From Various Sources.

## II. Objectives:

(a) To compare the growth rate, carcass qualities and maternal abilities of the progenies of bulls selected from various sources as potentially superior sires.

(b) To develop a high producing herd of cows by using the progeny of good producing bulls as replacement heifers.

(c) To determine the effectiveness of a selection index when used on heifers at weaning time.

## III. Accomplishments During the Year:

(a) Facilities and cattle acquired.

A 350 cow herd made up of grade Angus, Hereford and Shorthorn is presently being maintained on property leased from the Federal Government and located at Prairie, Mississippi.

(b) Research Results:

Calves from 6 bull units representing 180 cows were dropped during the spring of 1957. The bulls used were two Hereford and one Angus from the Mississippi Station, one Angus from the Virginia station, one Hereford from the Texas station and one Polled Hereford from the Georgia station. The first five steers born in each bull unit were selected as tester steers making a total of 28 steers (four steers used from two of the bulls) which were placed in a group on winter grazing consisting of oats and rye grass. Due to an extremely wet season this fall there will not be pasture available for the entire winter grazing period which will necessitate some feeding in dry lot. Selection of heifer progeny from each bull unit was done by selecting the top half of the heifers from each of the six sires on the basis of an index which gave equal emphasis to gain from birth to weaning and grade at weaning. In all 25 heifers were selected as replacements from the six sires and will be roughed through the winter and placed on pasture in the spring. It is hoped that next year there will be ample winter grazing for both the steers and heifers.

Data collected on the steer and heifer calves from the 1956 calf crop is reported for the winter grazing and also for the full feeding period on the steers.

The five bulls that were used in the herds this past spring were two Herefords from the Colorado station, one Hereford from the California station, one Hereford from the Mississippi station and one Polled Hereford from the Georgia station.

IV. Future Plans:

Project will be continued.

V. Publications During the Year:

None

VI. Publications Planned:

None.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1957

Prairie Station

| Line or group designation | Va.Angus T-161 | EN 16 | Texas 534 | Montana 558 | Georgia T-444 |
|---|---|---|---|---|---|
| Breeding | Angus | Hereford | Hereford | Hereford | Hereford |
| Sex: | Steers | Steers | Steers | Steers | Steers |
| No. | 5 | 5 | 5 | 5 | 5 |
| Av. age (fall 1956) | 242 | 240 | 245 | 243 | 245 |
| Av. wt. (fall 1956) | 453.2 | 448.0 | 477.0 | 469.0 | 476.0 |
| Days on pasture | 202 | 202 | 202 | 202 | 202 |
| Av. gain on pasture | 0.78 | 0.83 | .95 | .90 | .60 |
| Days on feed | 153 | 153 | 153 | 153 | 153 |
| Av. gain on feed | 1.72 | 1.99 | 1.90 | 2.00 | 1.95 |
| Animals slaughtered: | | | | | |
| Av. age at slaughter | 611 da. | 608 da. | 605 da. | 612 da. | 612 da. |
| Av. slaughter weight | 861.0 | 896.8 | 936.0 | 963.7 | 918.6 |
| Av. slaughter grade | 12.2 | 12.0 | 11.5 | 11.0 | 11.6 |
| Av. dressing percent | 56.6 | 55.9 | 55.8 | 57.0 | 56.6 |
| Av. carcass grade | 10.0 | 9.0 | 8.0 | 9.0 | 9.6 |

## POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

| Line or group designation | Va. Angus T-161 | EN 16 | Texas 534 | Montana 558 | Georgia T-444 |
|---|---|---|---|---|---|
| Location | Prairie | Prairie | Prairie | Prairie | Prairie |
| Breeding of calves | Angus | Here. | Here. | Here. | Here |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 | 0 |
| Heifers, No. | 8 | 8 | 7 | 8 | 8 |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 | 0 |
| Av. weaning wt. | 448.8 | 424.4 | 427.8 | 470.0 | 446.9 |
| Length of grazing period | 202 | 202 | 202 | 202 | 202 |
| Feed per cwt. gain (lbs) | | | | | |
| Concentrates | 0 | 0 | 0 | 0 | 0 |
| Roughage | 0 | 0 | 0 | 0 | 0 |
| Av. daily gain on test | 0.68 | .71 | .69 | .96 | .81 |

## PERFORMANCE OF COW HERDS. 1957 CALVES

Prairie Station

| Line of group designation | Here Duke | Ky. Angus | Va. Angus | Bridwell Texas | | Georgia |
|---|---|---|---|---|---|---|
| Breed of sire | Here. | Angus | Angus | Here. | Here. | Here. |
| Breed of dam | Here. | Angus | Angus | Here. | Here. | Here. |
| No. cows bred | 30 | 30 | 30 | 30 | 30 | 30 |
| No. cows calving | 14 | 13 | 25 | 24 | 23 | 27 |
| No. calves raised | 14 | 12 | 19 | 21 | 19 | 26 |
| Av. birth date | 3/13/56 | 3/19/56 | 2/25/56 | 2/25/56 | 3/3/56 | 3/10/56 |
| Av. birth wt. (lbs) | | | | | | |
| Bulls | 67.0 | 68.6 | 64.2 | 73.8 | 76.3 | 74.1 |
| Heifers | 68.8 | 64.5 | 61.7 | 68.2 | 70.6 | 72.6 |
| Were calves creep fed? | No | No | No | No | No | No |
| Av. weaning date: | | | | | | |
| Steers | 11/6/57 | 11/6/57 | 11/6/57 | 11/6/57 | 11/6/57 | 11/6/57 |
| Heifers | " | " | " | " | " | " |
| Av. weaning weight | | | | | | |
| Steers | 368.6 | 447.4 | 500.0 | 430.1 | 462.2 | 466.0 |
| Heifers | 404.0 | 377.5 | 457.0 | 429.1 | 427.6 | 428.2 |
| Av. weaning type score: | | | | | | |
| Steers | 11.5 | 12.5 | 11.9 | 11.0 | 11.4 | 11.6 |
| Heifers | 11.9 | 9.9 | 11.8 | 11.2 | 11.1 | 11.0 |
| Calves slaughtered at weaning: | ---------- | ---------- | NONE | ---------- | ---------- | ---------- |

NORTH CAROLINA STATION

-by-

E. U. Dillard and J. H. Gregory

I. Project Title:

State 74 - The Improvement of Beef Cattle Through Breeding Methods.

State 46 - The Development of Beef Cattle Especially Adapted to the Coastal Plains Region of North Carolina and Similar Areas.

II. Objectives:

(1) To establish breeding groups of cattle from top crosses of Brahman, Africander and Romo Sinuano bulls to grade Hereford cows.

(2) To evaluate the feedlot performance of purebred bulls and heifers of Angus, Hereford and Shorthorn breeds and prospective herd sires of the other breeding groups being established.

(3) To study total performance of progeny of bulls used in the same herd the same year.

(4) To study methods of measuring and evaluating performance of breed cows.

III. Accomplishments During the Year:

Purebred herds of each of three major beef breeds are maintained at the Central Research Station, Raleigh, N. C. Breeding females in these herds at present are as follows: Hereford - 38; Angus - 18; Shorthorn - 12.

A total of 10 body measurements and a body score are recorded on all individuals born into the herd at 6, 12 and 24 months of age or until they are culled from the herd.

Approximately one-half of the calves born and most of the heifer calves are put on performance tests soon after weaning for a period of 168 days. In the winter of 1956-57 seventeen bulls and 30 heifers completed this test.

As in previous years the four top indexed Hereford bulls (based on gain and conformation) were sent to two state owned research stations to be mated to commercial cows for progeny testing. Top bulls in the Angus group were sold to breeders in the state. Hereford tested bulls are in demand and at the present time 4 bulls that have been performance and progeny tested are being used by commercial breeders in the state.

Carcass data is obtained on practically all progeny of bulls used at the state research stations.

In 1957 nine of the Romo-Carolina cows and a bull were moved to the Frying Pan Experimental Range on the coast of North Carolina to provide

information on their performance under adverse environmental conditions. Five cows and a bull were kept at Raleigh as insurance against a complete loss of the line. Calf weights continue to be satisfactory for this line of cattle. One of the 1957 bull calves has been sent to the Instituto Inter Americano de Ciencias Agricolas, Turrialba, Costa Rica for use in their breeding research.

The breeding herds at the Frying Pan Experimental Range in 1957 are as follows: Brahman-Hereford - 33, Africander-Angus-Hereford - 24, grade Hereford - 17 and Romo Carolina - 9. All groups except the Romo Carolina were bred and calved on range. After a relatively high calving percentage in 1956 there was in 1957 one of the smallest calf crops, percentage wise, that has been experienced. Except for calves kept as possible herd replacements most calves were sold as veal at 5 -6 months of age. The calves did not carry much milk fat and consequently sold poorly.

Several additional herds were brought into the performance testing project this year. More than 7000 weights and grades were obtained on over 1500 head of calves on some 17 different farms. These herds are providing useful information for further study of correction factors for age of dam, sex of calf, etc. Several additional herds that could not provide data required for the research project are being assisted on performance testing work by the Extension Service.

Although this project has not been accepted as a contributing project to S-10, the project should yield valuable information on the improvement of beef cattle if data obtained from Record of Performance work is evaluated and compared with information from station controlled herds.

A new project "A Study of Performance Characteristics of Beef Cattle as Related to the Presence or Absence of the Genes for Dwarfism" was initiated in the spring of 1957 and is being submitted as a contributing project to S-10. Objectives of this project are:

(1) To compare progeny performance of bulls as related to the genotype for recessive dwarfism of the bull and of his progeny.

(2) To develop and improve biochemical techniques for detecting phenotypically normal cattle which carry genes for dwarfism and to correlate results obtained with results from the genetic study.

(3) To provide proof of freedom from recessive dwarfism for bulls to be used in the foundation herds at research stations.

A herd of 17 known carrier cows has been assembled at one of the state owned research stations. A 20 cow herd is planned with other open females being purchased in the spring of 1958 as they are located in the state.

IV. Future Plans:

State Project S-74 "The Improvement of Beef Cattle Through Breeding Methods" will continue according to project outline. The project (S-46)

having to do with the development of beef cattle especially adapted to the Coastal Region of North Carolina will be completely revised. The dwarf research work should be well underway in 1958 and some expansion of the research project on performance testing is anticipated. Attention will be given to publication of data now analyzed or being analyzed. There have been 13 Santa Gertrudis cows and one bull added to the herd at the Upper Mountain Research Station.

V. Publications:

Dillard, E. U. and A. V. Allen. North Carolina Beef Cattle Improvement Program. Mimeo. Report. 5 pp.

# POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Raleigh, North Carolina Station

| Line or group designation | Hereford | Angus | Brahman | Romo-Car | Africander |
|---|---|---|---|---|---|
| Location | Raleigh | | | | |
| Breeding of calves | Hereford | Angus | Br x H | R.S. x H | Af.xA.xH. |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 | 0 |
| Bulls, No. | 8 | 4 | 3 | 1 | 1 |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 | 0 |
| Av. weaning wt. | 522 | 538 | 269 | 532 | 295 |
| Av. 12 month wt. | 773 | 771 | 504 | 745 | 583 |
| Length of feeding period | 168 | 168 | 168 | 168 | 168 |
| Feed per cwt. gain (lbs) | | | | | |
| Concentrates | 7.97 | 7.97 | 7.97 | 7.97 | 7.97 |
| Roughage | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Av. daily gain on test | 1.96 | 1.79 | 1.40 | 1.82 | 1.71 |
| Av. type score (end of test) | 11.7 | 11.4 | 6.67 | 8.67 | 6.67 |

| | Hereford | Angus | Shorthorn | Romo-Carolina |
|---|---|---|---|---|
| Heifers, No. | 12 | 6 | 4 | 8 |
| Av. inbreeding (%) | 0 | 0 | 0 | 0 |
| Av. weaning wt. | 506 | 511 | 556 | 527 |
| Av. 12 month wt. | 640 | 607 | 704 | 639 |
| Length of feeding period | 168 | 168 | 168 | 168 |
| Feed per cwt gain (lbs) | | | | |
| Concentrates | 9.01 | 9.01 | 9.01 | 9.01 |
| Roughage | 2.38 | 2.38 | 2.38 | 2.38 |
| Av. daily gain on test | 1.22 | 1.17 | 1.88 | 1.36 |
| Av. type score (end of test) | 12.3 | 11.5 | 13.25 | 8.17 |

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1957

Raleigh, North Carolina Station

| Line or group designation | H-405 | H-417 |
|---|---|---|
| Breeding: | | |
| Sex: | Steers | Steers |
| No. | 8 | 8 |
| Av. age (fall 1956) month | 8 | 8 |
| Av. wt, Lbs (fall 1956) | 466 | 493 |
| Days on pasture | | |
| Av. gain on pasture | | |
| Days on feed | 156 | 156 |
| Av. wt. adjusted to 18 or 30 months of age | 740 | 780 |
| Av. gain on feed | 353 | 370 |
| Animals slaughtered: | 8 | 8 |
| Av. age at slaughter, months | 22 | 22 |
| Av. slaughter wt. | 1032.5 | 1104.4 |
| Av. slaughter grade | 10.75 | 10.62 |
| Av. dressing percent | 57.64 | 57.54 |
| Av. carcass grade | 12.125 | 10.75 |

Calves were wintered on full feed of corn silage plus 2 pounds of protein supplement per head daily.

The steers were moved from Tidewater Station to Raleigh and fed a full feed of ground ear corn for 156 days.

PERFORMANCE OF COW HERDS. 1957 CALVES

Raleigh, North Carolina Station

| Line of group designation | Hereford | Angus | Shorthorn | Romo-Caro. | Gr. Here. |
|---|---|---|---|---|---|
| Location | | | Raleigh | | |
| Breed of sire | Hereford | Angus | Shorthorn | R.C. x H. | Hereford |
| Breed of dam | Hereford | Angus | Shorthorn | R.C. x H. | Grade H. |
| No. cows bred | 38 | 20 | 9 | 10 | 10 |
| No. cows calving | 37 | 16 | 8 | 9 | 10 |
| No. calves raised | 33 | 15 | 7 | 9 | 9 |
| Av. birth date | 1/8/57 | 12/25/56 | 1/22/57 | 1/2/57 | 12/25/56 |
| Av. birth wt. (lbs) | | | | | |
| Bulls | 59.9 | 66.67 | 75 | 75 | 60 |
| Heifers | 63.5 | 58.7 | 72 | 70 | 68.7 |
| Were calves creep fed? | No | No | No | No | No |
| Av. wt at six months (lbs) | | | | | |
| Bulls | 304 | 377 | 437 | 403 | 320 |
| Heifers | 311 | 345 | 428 | 356 | 343 |
| Av. weaning date | | | | | |
| Bulls | 9/4/57 | 9/4/57 | 9/4/57 | 9/4/57 | 9/4/57 |
| Heifers | 10/21/57 | 10/21/57 | 10/21/57 | 10/21/57 | 10/21/57 |
| Av. weaning wt. | | | | | |
| Bulls | 448 | 508 | 529 | 550 | 433 |
| Heifers | 431 | 583 | 505 | 478 | 473 |
| Av. 182 day Feeder Grade | | | | | |
| Bulls | 10.3 | 10.67 | 10.5 | 6.5 | 11 |
| Heifers | 10.0 | 10.57 | 10.33 | 6.66 | 11.2 |
| Calves slaughtered at weaning | NONE | | | | |

PERFORMANCE OF COW HERDS. 1957 CALVES

Upper Mountain Research Station
North Carolina

| Line of group designation | Bull 421 | Bull 542 | Bull 551 |
|---|---|---|---|
| Location | L. Springs | L. Springs | L. Springs |
| Breed of sire | Hereford | Hereford | Hereford |
| Breed of dam | G.H. | G.H. | G. H. |
| No. cows bred | 17 | 12 | 13 |
| No. cows calving | 8 | 10 | 10 |
| No. calves raised | 7 | 9 | 9 |
| Av. birth date | 2/16/57 | 1/21/57 | 1/17/57 |
| Av. birth wt. (lbs) | | | |
| Bulls | 76 | 62.5 | 71 |
| Heifers | 72.5 | 62.5 | 65 |
| Were calves creep fed? | No | No | No |
| Av. wt. at six months (lbs) | | | |
| Steers | 372 | 298 | 327 |
| Heifers | 310 | 317 | 314 |
| Av. weaning date: | | | |
| Steers | 10/3/57 | 10/3/57 | 10/3/57 |
| Heifers | 10/3/57 | 10/3/57 | 10/3/57 |
| Av. weaning wt. | | | |
| Steers | 411 | 398 | 413 |
| Heifers | 360 | 443 | 414 |
| Av. weaning type score: | | | |
| Steers | 9.8 | 9.16 | 10 |
| Heifers | 8.5 | 9.33 | 9.4 |
| Calves slaughtered at weaning: | ---------- | NONE | ---------- |

# PERFORMANCE OF COW HERDS. 1957 CALVES

Tidewater Research Station
Plymouth, North Carolina

| Line of group designation | G.H. | G.H. | G.H. |
|---|---|---|---|
| Location | Tidewater Research Station | | |
| Breed of sire | H-574 | H-516 | H-506 |
| Breed of dam | G.H. | G.H. | G.H. |
| No. cows bred | 15 | 15 | 18 |
| No. cows calving | 12 | 14 | 17 |
| No. calves raised | 12 | 14* | 16* |
| Av. birth date | 2/2/57 | 1/30/57 | 2/1/57 |
| Av. birth wt (lbs) | | | |
| Bulls | 69.8 | 67.6 | 71.9 |
| Heifers | 68.8 | 67.2 | 67.9 |
| Were calves creep fed? | No | No | No |
| Av. wt. at six months (lbs) | | | |
| Steers | 377.16 | 347.1 | 357.0 |
| Heifers | 300.16 | 358.0 | 339.2 |
| Av. weaning date: | | | |
| Steers | 11/6/57 | 11/6/57 | 11/6/57 |
| Heifers | 11/6/57 | 11/6/57 | 11/6/57 |
| Av. weaning wt. | | | |
| Steers | 491.67 | 472.0 | 468.57 |
| Heifers | 396.67 | 463.75 | 459.44 |
| Av. weaning type score | | | |
| Steers | 11.33 | 10.5 | 9.57 |
| Heifers | 8.83 | 9.75 | 9.33 |
| Calves slaughtered at weaning | NONE | | |

* Includes one set of twins.

PERFORMANCE OF COW HERDS. 1957 CALVES

Frying Pan Experimental Range Station
North Carolina

| Line of group designation | G.H. | Br x G.H. | Af x A x G.H. |
|---|---|---|---|
| Location | ------Frying Pan Experimental Range--- | | |
| Breed of sire | Hereford | Br x G.H. | Af x A x H |
| Breed of dam | G.H. | Br x G.H. | Af x A x H |
| No. cows bred | 17 | 34 | 19 |
| No. cows calving | 9 | 14 | 9 |
| No. calves raised | 8 | 6 | 8 |
| Av. inbr of dams (%) | 0 | 0 | 5 |
| Av. inbr of calves (%) | 0 | 15 | 2 |
| Av. birth date | 3/18/57 | 3/29/57 | 3/11/57 |
| Av. birth weight | | | |
| Bulls | 69.75 | 48.5 | 64.2 |
| Heifers | 57.60 | 54.60 | 45.5 |
| Were calves creep fed? | ---------- | NO | ---------- |

ALL CALVES SOLD AT APPROXIMATELY 4 MONTHS OF AGE.

SOUTH CAROLINA STATION
-by-
E. G. Godbey

I. Project Title: No. SC 25.

The Use of Purebred and Crossbred Cows in the Production of Slaughter Calves.

II. Objectives:

To determine the birth and weaning weights, market and carcass grades and dressing percentages of fat calves sired by a Shorthorn bull and out of purebred Angus cows, or crossbred cows of the following breeding:

(1) Brahman x Hereford
(2) Brahman x Angus
(3) Hereford x Angus

III. Accomplishments During the Year:

Forty of the forty-two calves born in 1957 were weaned. Differences between groups in all characteristics studied were small. Calves out of Angus cows were lightest at birth and weaning; however, they had slightly higher slaughter and carcass grades. Calves out of Hereford x Angus crossbred cows were heaviest at weaning.

IV. Future Plans:

It is planned to produce one more calf crop from each breeding group, and the data obtained will be added to that which has been secured on the 175 calves produced to date.

V. Publications During the Year:

Godbey, E. G., L. D. Kyzer, L. V. Starkey, W. C. Godley. The Use of Purebred and Crossbred Cows in Slaughter Production, 1957 Proc. Sou. Agri. Workers Assoc. (Abstract).

PERFORMANCE OF COW HERDS. 1957 CALVES

S.C. Agri. Experimental Station

| Line of group designation | | | | |
|---|---|---|---|---|
| Location | Summerville, South Carolina | | | |
| Breed of sire | Shorthorn | Shorthorn | Shorthorn | Shorthorn |
| Breed of dam | Angus | H x A | B x A | B x H |
| No. cows bred | 12 | 11 | 11 | 11 |
| No. cows calving | 12 | 10 | 9 | 11 |
| No. calves raised | 10 | 10 | 9 | 11 |
| Av. birth date | 2/8/57 | 1/16/57 | 1/27/57 | 1/26/57 |
| Av. birth wt (lbs) | | | | |
| Bulls | 69.0 | 76.6 | 67.0 | 67.1 |
| Heifers | 63.2 | 66.7 | 67.5 | 69.3 |
| Were calves creep fed? | Yes | Yes | Yes | Yes |
| Av. wt. at seven months (lbs) | | | | |
| Steers | 497.9 | 520.7 | 465. | 543.8 |
| Heifers | 468. | 486.7 | 516.3 | 478.3 |
| Av. weaning date | | | | |
| Steers | 8/29/57 | 8/14/57 | 10/2/57 | 8/22/57 |
| Heifers | 9/14/57 | 8/15/57 | 8/21/57 | 8/30/57 |
| Av. weaning wt: | | | | |
| Steers | 497.9 | 520.7 | 465. | 543.8 |
| Heifers | 468. | 486.7 | 516.3 | 478.3 |
| Calves slaughtered at weaning: | | | | |
| 1. Steer or bull calves | | | | |
| No. | 7 | 7 | 1 | 8 |
| Av. age | 214 days | 212.1 days | 214 days | 212 days |
| Av. wt. | 488.6 | 507.9 | 480 | 530 |
| Av. slaughter grade | Good | Good | Good | Good |
| Av. dressing percent | 59.15 | 58.67 | 56.25 | 59.27 |
| Av. carcass grade | Good | Good- | Good | Good |
| 2. Heifer Calves | | | | |
| No. | 3 | 3 | 8 | 3 |
| Av. age | 208.3 days | 210.3 days | 212.9 days | 209.3 days |
| Av. wt. | 456.3 | 475.0 | 501.3 | 470.0 |
| Av. slaughter grade | Good + | Good | Good | Good+ |
| Av. dressing percent | 58.58 | 57.83 | 58.38 | 59.00 |
| Av. carcass grade | Good | Good | Good | Good+ |

TENNESSEE STATION

-by-

Charles S. Hobbs, H. J. Smith, and Joe W. High

I. Project Title: Hatch 61, Contributing to S-10,

The Improvement of the Producing Ability of Beef Cattle.

II. Objectives:

(a) To develop lines or line crosses, or combinations of lines and crosses, of beef cattle which will make the most efficient use of Tennessee pastures and forages and that will result in an improvement of such characters as rate of gain, economy of gain, carcass quality, fertility and longevity.

(b) To develop effective breeding techniques for the improvement of existing lines of beef cattle.

(c) To investigate the productivity of existing lines of beef cattle.

(d) To study the effect of different levels of nutrition on the development of type and conformation, on economy of gain, fertility and longevity.

III. Accomplishments During the Year:

Beef cattle breeding research under the Southern Regional Beef Cattle Breeding Project is being conducted at several locations in the state with herds at Knoxville, Alcoa (cooperative with the Aluminum Company of America), Oak Ridge (U.T.-A.E.C. Agricultural Research Program), Greeneville, Crossville, Spring Hill, Springfield and Grand Junction (Ames Plantation). The breeding program with Hereford and Angus herds at Knoxville includes a study of the effectiveness of selection based on type, performance and progeny testing in improving productivity. At Alcoa the Hereford herd is being used primarily for progeny testing of prospective herd sires and in the evaluation of methods for herd improvement. The herds at Oak Ridge include a Polled Hereford herd being developed by the best known methods of selection and a grade Hereford herd used in Hereford sire and line evaluation studies. A Polled Hereford line is being developed at Greeneville and horned Hereford lines at Spring Hill and Springfield. Performance selection will be emphasized in these lines with inbreeding kept as low as possible. The Angus herd at Ames Plantation will be used in sire testing, evaluation of Angus lines and in studies on performance selection. At Crossville the Angus herd is being used in a study and comparison of the effects of inbreeding, outbreeding and line-crossing on performance. In projects at some stations, the effect of creep feeding on evaluation of calf performance, cow productivity, and sire performance is being investigated. The value of calf gains, grades, and indexes at 120 days as criteria for evaluation of calf performance and cow productivity is included as a part of the project at each station. Overall selection and culling procedures are similar for all stations.

(a) Performance and Progeny Testing of Bulls and Heifers

During the fall and winter of 1956-57 the Tennessee station group-fed 17 Hereford and 14 Angus bulls under test conditions for 126 days on a mixed ration of chopped hay and concentrates plus about 10 pounds of silage per head daily. The bulls tested were selected from the calf crops of purebred herds at the various locations on the basis of a productivity index which gives equal importance to type grade and daily gain from birth to weaning. The feeding test was conducted at Knoxville under drylot conditions. The bulls were sorted within breeds on the basis of weight into groups of about 6 bulls. At the end of the test the most promising bulls were selected on the basis of weaning index and performance on post-weaning gain evaluation tests for development for use in progeny tests at two years of age. The results of the 1956-57 gain evaluation tests are shown in the accompanying table.

Approximately 200 heifers were fed on high roughage-limited grain rations on post-weaning gain evaluation tests during the winter of 1956-57. Rations within locations consisted of either silage, hay, or winter pasture plus 3-5 pounds of concentrates. Post-weaning gains and grades are used along with weaning indexes to select heifers to go into the breeding herds or to develop heifers for use in the breeding herds as replacements.

Evaluation of prospective herd sires was continued in 1956-57 with the progeny testing within locations of 12 Angus and 26 Hereford and Polled Hereford bulls in 1956. This progeny test data contributes information of value to the overall objectives of the project and is of specific value in selecting herd sires for the development of herds and lines. Results of these progeny tests show considerable differences between the progeny of bulls bred to comparable groups of cows within locations.

(b) Analyses of Data

During 1956-57, a study of the birth weights, daily gains from birth to weaning, type grades and condition grades at weaning of about 2600 calves born during the years 1952-56, inclusive, was made to determine the influence of sex of calf and age of dam on these traits. Differences between sexes and ages of dams were computed within location, breed, age of dam and year. There was no consistent trend in the average differences between sexes for the various ages of dams. Age of dam effects were most pronounced for daily gain from birth to weaning. The growth rate of calves increased with age of dam up to 6 years, remained relatively constant from 6 to 10 years and dropped off thereafter. Birth weights of calves increased with age of dam up to 3 years of age and then were very similar for dams 4 years of age and older. Calves from 2 and 3 year old dams weighed about 5 and 2 pounds less, respectively, than dams 4 years of age and older. Type grades of calves from 2-year old dams and dams over 10 years of age were about one-sixth of a full grade lower than type grades of calves from 3 to 10 year old cows.

The repeatability of cow performance in herds at various locations was calculated for the years 1952-56 inclusive. Repeatability was estimated by two methods: (1) intraclass correlation of calves by the same dam, and (2) correlation between performance records of calves of the same cow calving in successive years. Repeatability estimates obtained for birth weight, daily gain from birth to weaning and type grade fall within the range of estimates obtained by other workers. Repeatability estimates were very similar for both Hereford and Angus cattle. Repeatability of birth weight, daily gain and type grade at weaning as estimated by intraclass correlation was .22, .54 and .19, respectively. Repeatability as estimated by correlation between performance in successive years was .18, .36 and .31, respectively.

Detailed results of these analyses are presented in the "Report of the Annual Meeting of the S-10 Technical Committee" held at Gainesville, Florida in September 1957.

IV. Future Plans:

1. Continue the performance and progeny testing of sires.

2. Continue cow performance testing in all herds.

3. Continue the level of feeding studies.

4. Continue the development of lines and herds at the main station and substations.

5. Continue studies to evaluate the effect of creep feeding on calf performance, and on the measurement of cow and sire performance.

6. Continue studies to determine the value of calf gains, grades and indexes at 120 days as criteria for evaluation of calf performance and cow productivity.

V. Publications During the Year:

Faulk, Jimmy D. 1957. Influence of Age of Dam and Sex of Calf on Some Economic Characteristics in Beef Cattle. M.S. Thesis. University of Tennessee Library.

Walthall, Charles M. 1957. The Repeatability of Cow Performance in Beef Cattle. M.S. Thesis. University of Tennessee Library.

VI. Publications Planned:

Results of the work will be published as justified.

I. Project Title: Contributing to S-10.

The Detection of Animals Heterozygous for Recessive Bovine Dwarfism.

II. Objectives:

1. To investigate methods of identifying at young ages animals heterozygous for recessive bovine dwarfism.

III. Accomplishments During the Year:

To date radiographs of the lumbar vertebrae of approximately 1500 calves have been made. Under the hypothesis that carriers of the dwarf gene have a B type vertebrae and non-carriers have a C type vertebrae, it has been found that the percent of animals classified as B is too large. However, in general, as the frequency of the dwarf gene goes down in parents so does the percent of calves classified as B. This would indicate a general relationship between the X-ray classifications and the actual genotypes of the calves. Work at this station has shown that vertebrae abnormalities are influenced by line and bull differences. This may account for the fact that the X-ray classifications to be much more accurate in some herds than in others.

The X-ray method has been very accurate in identifying dwarf calves. Only one dwarf calf out of some thirty dwarfs that have been X-rayed was incorrectly classified. This particular dwarf had a vertebrae that was a borderline between a $B_8$ and a dwarf classification.

To check the accuracy of the X-ray, some ninety heifers X-rayed as calves were mated to dwarf bulls. The X-ray classifications of the progeny were summarized by the X-ray classification of the dam and the dwarfism status of her sire. One heifer with a C type X-ray produced a dwarf calf. It should be pointed out that this heifer was twenty-one days of age when X-rayed. Previous work done at this station (see A.H.-Vet.Sci. Mimeo 110) has shown that as a calf becomes older the vertebrae abnormalities present at birth tend to disappear. Therefore, it is entirely possible that had this heifer been X-rayed at birth she may have shown some vertebrae abnormalities and would have been classified as a carrier. Since the progeny of the heifers were all sired by dwarf bulls, any normal calf would be a carrier of the dwarf gene. Of the seventy-four normal calves (definitely not dwarf phenotypes), fourteen had normal vertebraes and were classified as C.

In addition to the heifer test matings, nine bulls (4 C type and 5 B type) were mated to known carrier cows. All the bulls with the exception of two bulls were sired by known carrier sires. Two bulls were sired by a pedigree clean bull; however, their dams were sired by a bull that proved to be a carrier. None of the C type bulls have sired a dwarf calf. Two of the three B type bulls sired by carrier bulls have been proven carriers (produced dwarf calves). This is actually more than would be expected to be proven at the present level of testing if only bulls by carrier sires are considered.

The blood work done at this station to date is still in the experimental stages and no prediction as to its accuracy can be made at this time.

Observations

The data in this study show:

1. The X-ray classified 60 out of 74 or 81% of the born carriers correctly.
2. In pedigree clean groups (presumed non-carriers) 60% were classified as C or normal and 40% B or abnormal. This suggests that factors other than the dwarf gene may lead to vertebrae abnormalities of the type studied.
3. Progeny tests of bulls and heifers from dwarf producing herds - at the present but at testing showed: (a) One out of 11 animals classified as C produced a dwarf calf; (b) Nine out of 37 animals classified as B have produced calves.
4. There appears to be a definite relationship between abnormalities of the lumbar vertebrae and the snorter dwarf gene. However, at the present time the X-ray technique is not sufficiently accurate to be used on an individual animal basis to detect carrier animals. The X-ray classification method is highly accurate in identifying dwarf calves.

A detailed summary of the results of the X-ray work to date can be found in the "Report of the Annual Meeting of the S-10 Technical Committee" September 1957.

IV. Future Plans:

1. Make a detailed study of the X-rays of lumbar vertebrae on hand to determine repeatability of classification and to search for diagnostic clues which may have been overlooked in previous classifications.

2. Continue body measurement studies with known heterozygotes (born carriers) and presumed (pedigree) clean animals.

3. Set up two herds of pedigree clean heifers of similar breeding alternate mating each herd in different years to dwarf and pedigree clean bulls.

4. Continue blood and other related studies.

VI. Publications:

High, Joe W. Summary of Dwarfism Research at the Tennessee Station. Annual Report of the NC-1 Technical Committee Meeting, July 1957.

VII. Publications Planned:

Technical article for publication in the Journal of Animal Science.

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Knoxville Station

| Line or group designation | Performance Testing | | |
|---|---|---|---|
| Location | Knoxville | Knoxville | |
| Breeding of calves | Hereford | Angus | All bulls |
| Bulls, No. | 17 | 13 | 30 |
| Av. inbreeding (%) | 0 | 0 | 0 |
| Av. weaning wt. | 505 | 497 | 502 |
| Av. 12 month wt. | 762 | 735 | 750 |
| Length of feeding period 1/ | 126 | 126 | 126 |
| Feed per cwt gain (lbs) | | | |
| Concentrates | | | |
| Roughage | | | |
| Av. daily gain on test | 2.22 | 2.07 | 2.16 |
| Av. type score (12 months) | 11.4 | 11.9 | 11.6 |

1/ Bulls were group-fed in lots of about 6 head per lot (sorted on a weight basis only). They were self-fed a mixed ration of chopped hay and concentrates plus 8 - 10 pounds of silage per head daily. The ratio of concentrates to roughage was approximately 1:1.

PERFORMANCE OF COW HERDS. 1957 CALVES

Alcoa Station
Tennessee

| Line of group designation | Unknown | 1233 | 4033 | 6432 | 9033 | 9046 | 9120 | 9171 | 9416 | 9487 |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | ALCOA | | | | | |
| Breed of sire | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. |
| Breed of dam | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. |
| No. cows bred | 24 | 24 | 22 | 23 | 19 | 22 | 24 | 25 | 22 | 14 |
| No. cows calving | 21 | 23 | 23 | 23 | 19 | 18 | 23 | 23 | 20 | 14 |
| No. calves raised | 21 | 19 | 17 | 19 | 18 | 18 | 22 | 20 | 15 | 14 |
| Av. birth date | 2/22/57 | 3/7/57 | 3/6/57 | 2/27/57 | 2/15/57 | 2/11/57 | 3/9/57 | 3/2/57 | 3/23/57 | 3/14/57 |
| Av. birth wt. (lbs) | | | | | | | | | | |
| Bulls | 76 | 74 | 77 | 76 | 68 | 69 | 64 | 71 | 79 | 73 |
| Heifers | 73 | 73 | 69 | 66 | 58 | 66 | 55 | 71 | 78 | 63 |
| Were calves creep fed? | No | No | No | No | No | No | No | No | No | No |
| Av. wt. at six months (lbs) | | | | | | | | | | |
| Bulls | 420 | 400 | 416 | 351 | 417 | 388 | 377 | 400 | 403 | 401 |
| Heifers | 406 | 368 | 382 | 304 | 369 | 372 | 343 | 362 | 393 | 351 |
| Av. weaning date: | | | | | | | | | | |
| Bulls | 10/10/57 | 10/10/57 | 10/10/57 | 10/10/57 | 10/8./57 | 10/11 | 10/9/57 | 10/8/57 | 10/8/57 | 10/9/57 |
| Heifers | 10/10/57 | 10/10/57 | 10/10/57 | 10/10/57 | 10/8./57 | 10/11 | 10/9/57 | 10/8/57 | 10/8/57 | 10/9/57 |
| Av. weaning wt. | | | | | | | | | | |
| Bulls | 407 | 476 | 498 | 419 | 517 | 496 | 409 | 452 | 447 | 437 |
| Heifers | 430 | 394 | 460 | 375 | 465 | 471 | 372 | 432 | 422 | 414 |
| Av. weaning type score | | | | | | | | | | |
| Bulls | 11.2 | 10.9 | 12.5 | 11.4 | 14.1 | 12.7 | 11.6 | 11.4 | 13.1 | 12.3 |
| Heifers | 11.4 | 11.4 | 12.3 | 10.1 | 13.9 | 11.7 | 12.9 | 11.1 | 11.7 | 12.0 |
| Av. weaning condition score | | | | | | | | | | |
| Bulls | 9.1 | 8.8 | 9.5 | 8.1 | 12.2 | 9.5 | 10.1 | 8.9 | 10.6 | 9.0 |
| Heifers | 10.2 | 10.6 | 11.0 | 7.1 | 11.7 | 9.8 | 11.6 | 9.3 | 10.1 | 10.1 |

PERFORMANCE OF COW HERDS. 1957 CALVES.

Tennessee Station

| Line of group designation | 5062 | 5133 | 5244 | 5284 | 9058 | 9145 | | | 6653 | 9197 | 9023 | 9217 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Crossville | | | | Greeneville | | Knoxville | | Springfield | | Spring Hill | |
| Breed of sire | Angus | Angus | Angus | Angus | Here. | Here. | Here. | Angus | Here. | Here. | Here. | Here. |
| Breed of dam | Angus | Angus | Angus | Angus | Here. | Here. | Here. | Angus | Here. | Here. | Here. | Here. |
| No. of cows bred | | | | | | | | | | | | |
| No. cows calving | 11 | 17 | 17 | 14 | 19 | 11 | 22 | 39 | 10 | 14 | 21 | 21 |
| No. calves raised | 9 | 12 | 16 | 14 | 12 | 7 | 18 | 29 | 9 | 13 | 18 | 19 |
| Av. birth date | 2/25/57 | 3/6 | 2/25 | 3/2 | 2/23 | 3/15 | 3/19 | 3/13 | 3/29 | 4/10 | 2/26 | 2/19 |
| Av. birth wt. (lbs) | | | | | | | | | | | | |
| Bulls | 62 | 63 | 65 | 69 | 82 | 69 | 64 | 63 | 67 | 66 | 71 | 66 |
| Heifers | 59 | 59 | 62 | 60 | 79 | 63 | 62 | 57 | 60 | 60 | 60 | 67 |
| Were calves creep fed? | No | No | No | No | No | No | No | No | No | No | No | No |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | | |
| Bulls | 397 | 423 | 405 | 386 | 470 | 428 | 377 | 369 | 400 | 399 | 344 | 355 |
| Heifers | 356 | 365 | 360 | 333 | 421 | 385 | 326 | 341 | 349 | 336 | 338 | 336 |
| Av. weaning date: Bulls: | 10/12 | 10/12 | 10/12 | 10/12 | 9/25 | 9/25 | 10/21 | 10/21 | 9/24 | 9/24 | 9/25 | 9/25 |
| Heifers | 10/12 | 10/12 | 10/12 | 10/12 | 9/25 | 9/25 | 10/21 | 10/21 | 9/24 | 9/24 | 9/25 | 9/25 |
| Av. weaning weight: | | | | | | | | | | | | |
| Bulls | 499 | 496 | 492 | 459 | 537 | 430 | 406 | 408 | 380 | 410 | 376 | 417 |
| Heifers | 422 | 438 | 438 | 396 | 486 | 408 | 382 | 412 | 352 | 327 | 387 | 304 |
| Av. weaning type score: | | | | | | | | | | | | |
| Bulls | 12.0 | 12.1 | 12.2 | 12.5 | 12.1 | 10.5 | 13.0 | 12.5 | 11.6 | 12.0 | 10.9 | 11.7 |
| Heifers | 10.4 | 12.1 | 12.6 | 11.8 | 12.2 | 11.6 | 12.2 | 12.6 | 11.8 | 12.0 | 11.4 | 10.8 |
| Av. weaning condition score: | | | | | | | | | | | | |
| Bulls | 9.8 | 9.6 | 9.4 | 9.6 | 7.8 | 7.0 | 9.8 | 10.9 | 8.0 | 8.7 | 9.5 | 10.3 |
| Heifers | 8.7 | 9.8 | 10.3 | 10.0 | 8.9 | 8.6 | 11.2 | 11.7 | 9.8 | 9.5 | 11.1 | 10.3 |

# PERFORMANCE OF COW HERDS. 1957 CALVES

Oak Ridge Station
Tennessee

| Line of group designation | Unknown | 3238 | 3246 | 3369 | 3529 | 3586 | 3688 | 3864 | 3865 | 9011 | 9029 | 9067 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | OAK RIDGE | | | | | | | | | | | |
| Breed of sire | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. |
| Breed of dam | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. |
| No. of cows bred | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| No. cows calving | 71 | 16 | 21 | 15 | 22 | 18 | 20 | 17 | 8 | 22 | 21 | 18 |
| No. calves raised | 50 | 14 | 19 | 12 | 21 | 14 | 18 | 15 | 8 | 20 | 20 | 16 |
| Av. birth date | 3/19/57 | 2/17/57 | 2/25/57 | 2/10/57 | 2/13/57 | 2/26/57 | 2/12/57 | 3/2/57 | 3/2/57 | 3/21/57 | 2/25/57 | 3/15/57 |
| Av. birth wt. (lbs)* | | | | | | | | | | | | |
| Bulls | 65 | 69 | 69 | 74 | 69 | 70 | 70 | 69 | 68 | 70 | 68 | 71 |
| Heifers | 59 | 63 | 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 | 63 | 61 |
| Were calves creep fed? | No | No | No | No | No | No | No | No | No | No | No | No |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | | |
| Bulls | 342 | 402 | 391 | 385 | 382 | 388 | 409 | 389 | 416 | 383 | 370 | 344 |
| Heifers | 319 | 340 | 366 | 359 | 333 | 348 | 332 | 321 | 317 | 346 | 329 | 307 |
| Av. weaning date: | | | | | | | | | | | | |
| Bulls | 10/18/57 | 10/18/57 | 10/18 | 10/18 | 10/18 | 10/15 | 10/18 | 10/17 | 10/18 | 10/15 | 10/16 | 10/18 |
| Heifers | 10/17157 | 10/17 | 10/17 | 10/15 | 10/16 | 10/15 | 10/17 | 10/17 | 10/18 | 10/15 | 10/15 | 10/18 |
| Av. weaning wt: | | | | | | | | | | | | |
| Bulls | 387 | 506 | 478 | 498 | 486 | 484 | 526 | 468 | 533 | 430 | 459 | 364 |
| Heifers | 365 | 436 | 458 | 468 | 422 | 442 | 428 | 376 | 368 | 408 | 409 | 333 |
| Av. weaning type score | | | | | | | | | | | | |
| Bulls | 11.1 | 10.8 | 10.6 | 11.6 | 10.2 | 10.5 | 12.1 | 10.8 | 11.3 | 10.1 | 10.9 | 10.7 |
| Heifers | 10.4 | 11.1 | 10.2 | 11.5 | 9.9 | 11.6 | 10.8 | 9.9 | 9.9 | 10.7 | 11.4 | 9.9 |
| Av. weaning condition score | | | | | | | | | | | | |
| Bulls | 7.8 | 7.6 | 8.1 | 7.4 | 7.9 | 7.8 | 8.3 | 7.9 | 8.0 | 7.6 | 7.6 | 7.6 |
| Heifers | 8.3 | 8.5 | 8.6 | 8.4 | 8.1 | 8.9 | 7.9 | 7.5 | 7.8 | 7.9 | 9.0 | 7.5 |

* Average according to sex and age of dam.

PERFORMANCE OF COW HERDS. 1957 CALVES

Ames Plantation, Tennessee Station

| Line of group designation | 9380 | 9385 | 9295 | 9203 | 1009 | 8205 |
|---|---|---|---|---|---|---|
| Location | AMES PLANTATION | | | | | |
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| No. calves raised | 6 | 10 | 13 | 16 | 20 | 6 |
| Av. birth date | 3/19 | 4/10 | 2/27 | 3/28 | 3/7 | 2/9 |
| Av. birth wt. (lbs) | 54 | 54 | 47 | 61 | 58 | 44 |
| Were calves creep fed? | No | No | No | No | No | No |
| Av. wt. at 6 months (lbs) (182 days) | 367 | 360 | 320 | 352 | 373 | 290 |
| Av. weaning date: | 10/22 | 10/25 | 10/25 | 11/1 | 10/21 | 11/1 |
| Av. weaning wt.: | 428 | 387 | 411 | 408 | 449 | 399 |
| Av. weaning type score: | 12.2 | 13.2 | 12.7 | 11.8 | 11.7 | 12.2 |

TEXAS STATION
-by-
T. C. Cartwright

I. Project Title: No. 607. Contributing to S-10.

Improvement of Beef Cattle Through Selection of Performance Tested and Progeny Tested Sires.

II. Objectives:

1. To determine heritability of gain and other economic characteristics as beef conformation, quality of flesh, earliness of maturity, and size of animal.

2. To study the effects of the application of such information on the improvement of breeding herds.

3. To determine the mode of inheritance of the pigmentation of eye lids and to determine the relationship of eye lid pigmentation to "cancer eye".

4. To make detailed analysis of appropriate existing data.

5. To determine suitable and economical rations of locally grown feeds and supplements for proper development of young breeding stock.

III. Accomplishments During the Year:

Tests under this project are conducted at three different locations.

Balmorhea:

a. All pens (20) except the six new ones that were built in 1956, were rebuilt. Also cleachie was put in the old pens to a depth of five to six inches, with the exception of the four being used for steer feeding. A new pair of Toledo dial type scales were purchased for weighing cattle. The Mayrath Elevator Company donated a twenty-one foot, six inch auger and a seventeen foot and twenty-five foot elevator to facilitate handling of feed.

b. Last year 91 bulls, 14 heifers and 36 steers were on test for 140 days. The test began October 21 and was concluded on March 1, followed by a Field Day on March 9. Mimeographed material concerning the test and also a program were available to the approximately 300 in attendance. The gains were as follows: 91 bulls - 2.42 pounds per day, 14 heifers - 2.79 pounds per day, 22 steers - 2.46 pounds per day, and 14 steers - 2.15 pounds per day. Steers were added to the 1956-57 test and where we had six or more progeny from a sire, half of the progeny was fed the same growing ration as the bulls (approximately 30 percent concentrate and 70 percent roughage) and the other half was fed an average of 60 percent concentrate during the 216 day feeding period. The difference in ration accounts for the difference in gain of the two steer groups.

In 1950-51 the highest gaining bull on test gained 3.23. He came on the test with a 2.3 pounds average daily gain per day of age and when the test was concluded, his average daily gain per day of age was 2.6 pounds, which was the highest pounds per day of age of any animal that has finished the Balmorhea test in 16 years of testing. This bull had two bull progeny on test last year and two steer progeny on each of the two rations. The convincing and interesting thing about this fact is that these progeny outgained all other progeny on their respective test.

Two sire groups of steers certainly did not gain as expected. One sire group of three gained 2.58 pounds per day on the concentrate ration, which was slightly above average for the ration; however, their three half brothers on the growing ration only gained 1.85 pounds per day, which was .29 pounds per day below the average for the ration. Another sire group of three gained 2.06 pounds per day on the concentrate ration, which was the low for the ration, but their half brothers on the growing ration gained 2.19 pounds per day. All other groups gained about as expected on their respective rations. Slaughter and carcass data were collected on all the steers.

McGregor:

a. No new facilities.

b. Two separate tests were conducted again this past year. In the first test there were 278 cattle of which 140 were entered by cooperators. There were 78 on the second test with 54 entered by cooperators. The average daily gains were: bulls, 2.3 and 2.5; heifers, 1.8 and 1.5; and steers, 2.0 and 2.0 for the first and second tests respectively. Over the years since 1950 there has been a trend for the high gain to rather markedly increase each year and for the low gain to increase slightly. The high gains are coming from herds which have been selecting on performance records. A summary of gain testing records at this station by breed and sex is given below:

CATTLE BREED AND CROSS CODES USED AT McGREGOR

| | | Dam x Sire | |
|---|---|---|---|
| A | Angus | 1 | HXB |
| B | Brahman | 2 | BXH |
| BA | Brangus | 3 | 1XH |
| BM | Beefmaster | 4 | 1XB |
| C | Charbray | 9 | HX1 |
| G | S. Gertrudis | 11 | HXG |
| H | Hereford | 12 | HXR |
| I | Holstein | 13 | 1XG |
| J | Jersey | 14 | 1XR |
| L | Charolaise | 21 | 1X1 |
| R | Red Poll | 23 | 4XB |
| RA | Red Angus | 32 | 11XG |
| RB | Red Brangus | 51 | RXG |
| S | Shorthorn | 97 | 3/4H - 1/4B |
| | | 98 | BXJersey |

SUMMARY OF GAIN TEST RESULTS 1949-50 THROUGH 1956-57
McGregor, Texas

| Breed or Cross | BULLS No. of Animals | Avg. Daily Gain | Highest Indv. Avg. Daily Gain | Stan. Dev.(within yrs) | HEIFERS No. of Animals | Avg. Daily Gain | Highest Indv. Avg. Daily Gain | Stan. Dev.(within yrs) |
|---|---|---|---|---|---|---|---|---|
| Angus | 66 | 2.1 | 2.7 | .28 | 41 | 1.6 | 2.1 | .22 |
| Beefmaster | 3 | 2.4 | 2.4 | -- | -- | -- | -- | -- |
| Brahman | 111 | 1.7 | 2.5 | .26 | 126 | 1.4 | 2.1 | .23 |
| Brangus | 16 | 2.4 | 2.9 | .25 | 1 | 1.7 | 1.7 | -- |
| Charbray | 20 | 2.6 | 3.2 | .30 | 66 | 1.9 | 2.9 | .36 |
| Charolais | 11 | 2.8 | 3.6 | .39 | 9 | 1.9 | 2.3 | .13 |
| Hereford | 219 | 2.2 | 3.3 | .37 | 365 | 1.6 | 2.3 | .22 |
| Red Brangus | 1 | 2.4 | 2.4 | -- | -- | -- | -- | -- |
| Red Poll | 13 | 2.4 | 2.8 | .34 | 10 | 1.7 | 1.9 | .13 |
| St. Gert. | 164 | 2.5 | 3.8 | .42 | 81 | 1.7 | 2.8 | .27 |
| Shorthorn | 17 | 2.3 | 2.9 | .23 | 5 | 1.7 | 2.3 | .24 |
| 1 cross | 45 | 2.5 | 3.3 | .28 | 277 | 1.7 | 2.6 | .28 |
| 2 cross | 2 | 2.2 | 2.2 | -- | -- | -- | -- | -- |
| 3 cross | 21 | 2.6 | 3.1 | .31 | 52 | 1.7 | 2.2 | .24 |
| 4 cross | 25 | 2.2 | 2.8 | .34 | 47 | 1.6 | 2.3 | .27 |
| 9 cross | 10 | 2.6 | 2.9 | .22 | 14 | 1.8 | 2.0 | .18 |
| 11 cross | -- | -- | -- | -- | 27 | 1.9 | 2.3 | .18 |
| 12 cross | -- | -- | -- | -- | 6 | 1.8 | 2.0 | .18 |
| 13 cross | -- | -- | -- | -- | 14 | 1.8 | 2.4 | .33 |
| 14 cross | -- | -- | -- | -- | 11 | 1.7 | 2.0 | .20 |
| 21 cross | -- | -- | -- | -- | 5 | 1.6 | 1.8 | .18 |
| 32 cross | -- | -- | -- | -- | 1 | 2.2 | 2.2 | -- |
| 51 cross | -- | -- | -- | -- | 4 | 1.6 | 1.8 | .22 |
| 97 cross | 3 | 2.5 | 2.5 | -- | -- | -- | -- | -- |
| 98 cross | 2 | 2.5 | 2.6 | -- | 2 | 1.9 | 1.9 | -- |
| | 749 | 2.3 | 3.8 | .34 | 1164 | 1.7 | 2.9 | .25 |
| | Steers Fed Growing Ration* | | | | Steers Fed Fattening Ration** | | | |
| Brahman | -- | -- | -- | -- | 10 | 1.3 | 1.5 | .17 |
| Hereford | 96 | 2.0 | 2.9 | .24 | 115 | 2.0 | 2.9 | .31 |
| Holstein | -- | -- | -- | -- | 4 | 2.6 | 2.8 | .17 |
| Red Poll | -- | -- | -- | -- | 2 | 2.0 | 2.2 | -- |
| S.Gert. | 4 | 2.0 | 2.1 | .19 | 20 | 2.0 | 2.6 | .45 |
| 1 cross | 132 | 2.0 | 3.2 | .31 | 119 | 2.1 | 2.6 | .32 |
| 3 cross | -- | -- | -- | -- | 11 | 1.7 | 2.3 | .38 |
| 4 cross | -- | -- | -- | -- | 26 | 1.6 | 2.4 | .46 |
| 9 cross | -- | -- | -- | -- | 6 | 2.1 | 2.6 | .42 |
| 11 cross | 9 | 2.1 | 2.4 | .15 | 10 | 2.1 | 2.7 | .37 |
| 12 cross | -- | -- | -- | -- | 12 | 2.2 | 2.6 | .31 |
| 13 cross | -- | -- | -- | -- | 20 | 1.8 | 2.3 | .33 |
| 14 cross | -- | -- | -- | -- | 9 | 1.8 | 2.2 | .15 |
| 21 cross | -- | -- | -- | -- | 2 | 1.2 | 1.3 | -- |
| 23 cross | -- | -- | -- | -- | 1 | 1.9 | 1.9 | -- |
| 32 cross | -- | -- | -- | -- | 1 | 2.1 | 2.1 | -- |
| 51 cross | -- | -- | -- | -- | 4 | 2.1 | 2.6 | .49 |
| 99 cross | -- | -- | -- | -- | 2 | 1.7 | 1.8 | -- |
| | 241 | 2.0 | 3.2 | .28 | 374 | 2.0 | 2.9 | .33 |

* 65% hay, 15 C.S.M., 20 Milo - all ground, mixed and self fed.
** 30% hay, 10 C.S.M., 60 Milo- all ground, mixed and self fed.

PanTech Farms:

A total of 140 bulls were gain tested and the group averaged 2.53 pounds per day.

The project statement for project 607 at PanTech was revised this year. We are now collecting information on weaning weights and pre-test gains on all bulls before the official feeding test begins. The objectives of this project now read:

(1) To compare the gaining ability of bulls from different sources when they are fed the same ration under uniform conditions.

(2) To determine the relationships that exist among the following characteristics:
   (a) Gain on 140 day feed test.
   (b) Weaning weight adjusted to 205 days of age.
   (c) Actual weaning weight.
   (d) Gain from weaning to start of test.
   (e) Initial test weight.
   (f) Age at start of test.
   (g) Efficiency of feed utilization during 140 day feed test.

(3) To develop a method of evaluating and selecting superior sires, based on the information given above.

We are now in the process of summarizing seven (7) years data on the bull feeding test.

IV. Future Plans:

Balmorhea:

The gain evaluation test will be continued as in the past. Also with the conclusion of the 1957-58 test, all bulls on test will be checked for fertility by use of the electro-ejaculator, and if possible, follow up test will be made in future years.

It is anticipated that more emphasis will be placed on information received from steers and this part of the test will be continued to seek much needed carcass evaluation information.

McGregor:

The gain evaluation test will be continued as in the past. Study of gaining ability will be extended to contrast the response of inherently low and inherently high gainers to stilbestrol and other hormones, reserpine and other tranquillizers, terramycin and other antibiotics and other feed additives or growth promoters that appear promising and have been proven of value in nutritional studies.

PanTech:

A new cow project was approved June 6, 1957. No data are yet available on this project.

This project is designated as State Project S-1129. The objectives read as follows:

(1) To compare the performance; as measured by weaning weight and grade, stocker gain and grade, feed lot gain and grade, and carcass characteristics, of four beef cattle herds selected as follows:

a. An "A" herd in which herd sires and replacement heifers are selected by giving equal emphasis to conformation and gaining ability.

b. A "B" herd in which herd sires and replacement heifers are selected on gaining ability.

c. A "C" herd in which herd sires and replacement heifers are selected by visual appraisal, using current show ring standards of conformation.

d. An "F" herd in which herd sires and replacement heifers are selected for low gaining ability.

(2) To determine the relationships that exist among the above mentioned characteristics in beef cattle.

It is planned that all records will be put on IBM cards.

V. Publications:

Balmorhea:

Melton, A. A., Jones, J. H., R. E. Patterson. Field Day Report 1956-57, Balmorhea.

McGregor:

Cartwright, T. C. 1957. Beef Cattle Gain Evaluation Test Reports, Texas Agri. Exp. Sta. Misc. Publications 178a,b,c,d,e, and f and 194a,b,c,d,e and f.

Shelton, Maurice, T. C. Cartwright and W. T. Hardy. 1957. Relationships Between Performance Tested Bulls and the Performance of Their Offspring. Texas Agri. Exp. Sta. P. R. 1958.

PanTech:

Smith, J. P. and George F. Ellis, Jr. Beef Cattle Improvement Investigations 1956-57. Mimeographed booklet.

VI. Publications Planned:

Results of 1957-58 Gain Test, Balmorhea, Texas
Reports for 1957-58 Gain Evaluation Tests, McGregor, Texas
Results of 1957-58 Beef Cattle Improvement Investigations, PanTech Farms.

As soon as all of the data at PanTech are summarized, a progress report on the bull feeding test will be published.

I. Project Title: Texas Project No. 714. Contributing S-10.

Methods for Measuring Potential Rate of Gain and Efficiency of Feed Utilization in Immature Beef Cattle. H. O. Kunkel.

II. Objectives:

(a) To develop methods of a biochemical or physiological nature which will measure the potential rate of gain in the immature beef animals.

(b) To develop methods of measurement of the potential efficiency of utilization of feed for building body tissue.

III. Accomplishments During the Year:

(a) New laboratory facilities in the new Biochemistry and Dairy Building have been occupied during the year. Considerably more laboratory space is now available.

(b) In the 1956 Annual Report of S-10 a major objective outline for the year 1957 was the development of multiple regression equations with the principal purpose of evaluating each contributing factor with respect to the extent of its contribution to the measurement of potential rates of gain. These analyses were dependent upon the completion of a chemical analyses for protein bound iodine. As a result of recurring difficulties in the protein bound iodine analyses, these determinations were not completed until the latter part of 1956, and the calculations of the regression equations have not been completed.

Serum Protein Bound Iodine

The principal effort of these investigations continue to be the study of the serum protein-bound iodine (PBI) values. A major alteration of the power source equipment for the determination of protein-bound iodine is being made at the present time. This alteration is expected to provide maximum accuracy in the determinations.

After extensive studies, the data do not indicate that the PBI in itself will account for a large amount (less than 20%) of the variance in rates of gain. A curvilinear correlation may exist but has been verified in only a few groups of animals. However, since some difficulty has been experienced in the method of analyses, even during the past year, complete evaluation of the relationship of protein bound iodine to rates of gain must be delayed until maximum accuracy can be obtained in the determination.

Occasional statistically significant correlations have been noted between the PBI and serum globulins, blood glutathione or hemoglobin level. Evidence of significant individual differences in PBI have been found to exist during a feeding period. Estimates of heritability of differences in PBI have been calculated from half-sib correlations, but have been higher than estimates of repeatability suggesting the expression of the effects of similar pre-test environmental conditions of those calves within each sire group persisting throughout the feeding period and different pre-test conditions of groups of calves from different breeders.

## Gluthathione

The investigation of the levels of reduced glutathione and hemoglobin levels have been continued through the year. Further evidence has been obtained to suggest that with groups of Brahman, Charbray and Angus cattle there is a significant curvilinear relationship between glutathione and the rates of gain. Multiple coefficients of correlation using gain as a dependent variable and initial age, initial weight, the glutathione-hemoglobin (GSH/Hb) ratio and the $(GSH/Hb)^2$ as independent variables have ranged from .68 to .74 in these three breeds of animals. In the Herefords and Santa Gertrudis cattle the relationship between glutathione, age, and weight with gain appears to be of less significance.

## Serum Proteins

Serum proteins have been fractionated by the temperature independent sodium sulfite fractionation methods into an albumin and a globulin fraction. Preliminary evaluation indicates that the albumin-globulin ratio is significantly correlated with the gain again in certain of animals. Significant coefficient correlations, ranging from 0.40 to 0.45, between the serum albumin and rate of gain have been obtained with groups of Hereford and Angus cattle. The correlation between globulin or albumin with rate of gain in Santa Gertrudis cattle was not significant statistically.

## Serum Oxidase

During the latter part of the year 1957 attention was directed to the work coming from Sweden in which an apparent test of stress was being worked out in the laboratories of Akerfeldt. This test was concerned with the oxidation of N, N-dimethyl-p-phenylenediamine (DPP) by serum. This property of serum is apparently due to the enzyme, ceruloplasmine, and appears to be influenced by stresses such as liver disease, pregnancy and schizophrenia. Preliminary evidence indicates that the level of oxidizing capacity is inversely related to the leucocyte count and is not markedly affected by treatment by insulin or by fasting. It appears to be more variable in young animals than in older animals. The relation between the oxidase activity and rate of gain has however not been evaluated as of this date.

## IV. Future Plans:

The determination of PBI on all stored samples of blood will be completed. Final evaluation of the value of the level of PBI, serum phosphatase, glutathione and blood proteins will be attempted.

The investigation of the levels of serum DPP oxidase activity will be expanded. In addition electrophoretic analyses of serum proteins will be initiated with the hope of uncovering relationships of various serum proteins to gain. Other approaches suggested by experimental findings with other animals will be explored as time and facilities permit.

The use of experimental animals in record of performance tests and on private ranches will be continued.

V. Publications:

Kunkel, H. O., G. G. Green, J. K. Riggs, R. L. Smith and M. C. Shrode. Relationships Between Serum Protein Bound Iodine and Other Blood Constituents to Rates of Gain in Beef Cattle. J. Ani. Sci. 16, 1030 (1957). Abstract.

Green, G. G., D. K. Stokes, Jr., C. M. Lyman, and H. O. Kunkel. Variations in Serum Protein Bound Iodine Levels in Immature Beef Cattle. J. Ani. Sci. 16, 1070 (1957). Abstract.

Stutts, E. C., W. E. Briles, and H. O. Kunkel. Plasma Alkaline Phosphatast Activity in Mature Inbred Chickens. Poultry Sci. 36, 269 (1957).

VI. Publications Planned:

Publications are planned describing the value of glutathione, protein bound iodine, and serum globulin and albumin in the prediction of the rates of gain.

I. Project Title: Texas Project 959. S-10 Contributing.

Biochemical and Physiological Anomalies of Bovine Dwarfism and Their Use in Detection of Heterozygotes. H. O. Kunkel.

II. Objectives:

1. The detection of biochemical physiological anomalies which may associate with bovine dwarfism of various types, with an attempt to identify the metabolic defects which cause dwarfism.

2. The determination of the usefulness of biochemical or physiological anomalies, which may be detected in dwarfs, in the detection of the heterozygotic phenotypically normal animals.

III. Accomplishments During the Year:

The major effort in this research during the year 1957 was directed to the test of the effect of insulin stress in "snorter" dwarf animals, carrier animals and in pedigree clean animals.

Blood glucose and plasma free glutamic acid, glycine, and histidine have been determined in association with insulin induced stress in dwarf and normal animals. No significant differences in responses were detected.

Total leucocyte counts, using 0.1 N HCl as the diluent, and differential cell counts were made following the injection of crystalline zinc insulin. Under the conditions of these tests, significant increases after

two hours in the total leucocytes were obtained in the dwarf carrier animals and dwarfs but not in animals from a herd in which there had been no incidence of dwarfism. Differential counts and calculations indicate that the only changes occur in granular leucocytes with an increase in neutrophiles and a slight decrease in eosinophiles. These results appear to contradict the work at Missouri and South Dakota, which had indicated an increase in the neutrophiles in normal animals. Thus, since the dwarf and carrier animals used in these experiments were from the same ranch source, the differences in response may be due to line of breeding differences and may have little correlation to the dwarfism character.

The ability of the blood serum to oxidize N, N-dimethyl-p-phenylenediamine is also investigated in normal and dwarf animals. The level of plasma oxidase activity in a small group of dwarf carrier and normal cows is not markedly affected by the insulin treatment in either normal or the carrier cow. Differences in oxidase activity do not appear to be related to the dwarfism character.

IV. Future Plans:

In view of the continued indication that the dwarfism characteristic may be correlated with possible deranged carbohydrate metabolism, investigations of various phases of carbohydrate metabolism will be continued. Special attention will be made to variations in the hexose-monophosphate shunt pathways of carbohydrate metabolism in dwarf, dwarf carrier and in normal animals. Continued extended work on the effect of insulin is not anticipated. In addition, further studies will be made of a variety of blood constituents and tissue components, not yet studied, as a continued search for the biochemical disorder in the bovine dwarf.

V. Publications:

Deyoe, C. W., M. C. Shrode, W. C. Banks, and H. O. Kunkel. Quantitative Chemical and Granulocytic Changes in Insulin-induced Stress in Mature Dwarf Bovine and Heterozygote Females. J. Ani. Sci. 16, 1029 (1957). Abstract.

Deyoe, C. W., The Stress Effects of Fasting and Insulin-induced Hypoglycemia on the Osteochrondrodystrophic-like Dwarf. M.S. Thesis, A. and M. College of Texas, August, 1957.

VI. Publications Planned:

None.

I. Project Title: Texas Project No. 650. S-10 Contributing.

The Improvement of Production and Adaptation of Beef Cattle Within Purebreeds and Certain of Their Crosses Through Breeding Methods.
T. C. Cartwright.

II. Objectives:

a. The improvement of rate of gain of beef cattle by selection based on weaning weight and gain in the feed lot.
b. The improvement of rate of gain in the Brahman breed by crossing with the Hereford and backcrossing to the Brahman with recurrent selection.
c. To evaluate cattle with regard to adaptability to environment, especially during the summer months.
d. To improve production during the hot months by selection based on individual summer gain and other evaluation records.
e. To determine the magnitude of carcass differences within breeds and to determine the heritability of differences.
f. To evaluate new crosses and breeds with respect to carcass merit.
g. To determine the relative potential value of the carcasses of bulls culled from the project.
h. To evaluate the significance of hybrid vigor in hybrids and their offspring with regard to gaining ability, carcass value, fertility adaptability and hardiness.
i. To make available breeding animals of proven superiority.

III. Accomplishments During the Year:

(a) Facilities and cattle acquired.
A herd of 15 Angus females was acquired from private individuals and from the Texas A & M College herd by loan. One "Miles City" Hereford bull was purchased from Mississippi State College. One $1\frac{1}{2}$ ton stock truck and one tandem wheel stock trailer were added for principle use with cattle.

(b) Research results:
In an effort to more fully evaluate the influence of heredity on tenderness more emphasis has been placed on study of this character in recent months. The tenderness of the meat from 49 steers which were approximately 15 months of age, raised at McGregor and slaughtered at College Station was measured in the Food Research Laboratory of the Home Economics Department. Represented were Hereford (H); Brahman (B); $F_1$, $\frac{1}{2}H-\frac{1}{2}B$ (B sires); backcross, $3/4H-\frac{1}{4}B$; and backcross, $3/4\ B-\frac{1}{4}\ H$; from 5 Hereford and 6 Brahman sires. Loins and bottom rounds were cooked by broiling to 61°C. and 80°C. and by braising to 85°C. and 100°C. Four judges scored the meat for softness, friability and connective tissue. Mechanical shear force values were obtained. Of the 8 possible "temperature and cut" categories the number with significant differences due to breed of sire was as follows: softness, 1; friability, 2; residual connective tissue 0; and shears, 3. The number of significant differences due to sires within breeds was as follows: softness, 3 for Brahman sires; friability, 2 for Brahman sires; residual connective tissue, 4 for Brahman sires and 2 for Hereford sires; and shears, 1 for Brahman sires. Earlier work indicated high but variable heritability estimates for shears and tenderness scores based on similar small numbers. This work continues to indicate that the heritability of certain eating quality characters may be of a magnitude to allow

effective selection. There was more variability among the Brahman sire groups sampled than among the Hereford sire groups. Progeny of some Brahman sires equalled or excelled in tenderness those of some Hereford sires, but this was not true for all Brahman sires. More work is needed to establish a basis for selection of tenderness of beef. A further analysis of production and carcass data from 18 Hereford and 20 Brahman x Hereford steers was completed. These steers were born on the McGregor Station and treated similarly until after weaning when equal numbers of each breed or cross were fed high and low concentrate rations. They were slaughtered and their carcasses and meat studied in the Animal Husbandry and Home Economics Departments at the A & M College of Texas.

Differences in concentrate content of the ration had little effect on the growth or other characteristics of the steers except that those which received the higher concentrate ration, especially the Herefords, were slightly higher in most measures of fat, whereas muscular development was less affected.

The crossbred steers had slightly higher carcass weights per day of age due mostly to heavier birth weights and higher gains to 180 days of age as well as higher dressing percents. The scores or grades of the crossbreds, generally considered of less desirable conformation because of drooping rumps, longer legs and general ranginess, tended to improve more than the Herefords from weaning until slaughter. The Herefords tended to deposit more fat at more locations, but the fat deposition pattern is apparently different for the crossbreds since they deposited more fat at some locations. These young crossbreds tended to be somewhat more of a meat type steer. In the data presented in this paper differences due to sires were not statistically significant except for age, which was considered due to change, and separable lean in 9-10-11 ribs per day of age for which heritability was estimated to be approximately 5%.

A correlation study of the inter-relationships of the variables indicated that birth weight, gain to 180 days of age and gain in the feed lot are all indications of growth potential and that weaning weight has the most marked influence on final weight. Growth at any period is positively correlated with scores or grades taken subsequently. It appears that size of ribeye, weight of cusion round and other cuts change percentagewise with changes in fatness but at the same degree of finish are markedly influenced only by differences in weight of the steer suggesting that selection for rate of gain is effective in increasing weight of cuts or size of ribeye and that differences in proportions are very small regardless of appearance either on foot or on the hook.

Selection for heavier weights at weaning and higher post weaning gains in yearlings should improve carcass grade slightly. If the trend toward "meat type" cattle continues to an extent similar to that in swine, roughage rations and gaining ability should be emphasized even more.

Visual appraisal for performance or carcass quality other than mere fat is practically useless and may be harmful if allowed to influence selection since selection differentials for important characters would necessarily be reduced. However, present day standards, although increasingly dynamic, still place considerable sales value on visual appraisal of conformation.

IV. Future Plans:

Data collected to date will be analysed to determine the effect of various influences, such as breed of dam, have had on weaning weights. The influence of weaning weight on feed lot gain, gain on pasture, carcass and meats characteristics, and other variables will be included.

In an effort to adequately evaluate gaining ability and to gain insight into the physiological causes for differences in gain study with the following objectives will (or has recently been) initiated:

1. To contrast the response of inherently low gainers and inherently high gainers to growth promoters (such as stilbestrol, tranquillizers and antibiotics).

2. If differential response is found, to determine by biochemical methods, blood levels of appropriate chemical compounds.

3. If differential response is found, to determine the effects of the growth promoters on tenderness and other qualities of beef.

V. Publications During the Year:

Cartwright, T. C., Sylvia Cover and O. D. Butler. 1957. The Relationship of Inheritance to Tenderness of the Meat of Yearling Steers. Jour. Ani. Sci. 16: (Abstract).

Cartwright, T. C., O. D. Butler and Sylvia Cover, 1957. The Relationship of Ration and Inheritance to Certain Production and Carcass Characteristics of Yearling Steers. Jour. Ani. Sci. (in press).

Cover, Sylvia, T. C. Cartwright and O. D. Butler. 1957. The Relationship of Ration and Inheritance to Eating Quality of the Meat From Yearling Steers. Jour. Ani. Sci. 16:

VI. Publications Planned:

Cartwright, T. C. The Inheritance of Weaning Weight Data in a Breeding Herd of Beef Cattle.

Butler, O. D., T. C. Cartwright and Sylvia Cover. The Inter-Relationship Among Certain Measures of Fat Deposition and Muscular Development in Yearling Steers.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1957

| Location | McGregor | McG. | McG. | McG. | McG. | McG. | McG. | McG. | McG. | Total or | Balmorhea |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Breeding: | H | H | H | B | B | G | 1X | 4X | 13X | Avg. McG. | |
| Sex: | M | F | S | M | F | S | S | S | S | 3 | |
| No. | 5 | 6 | 8 | 4 | 3 | 4 | 6 | 8 | 4 | 48 | |
| Av. age (fall 1956) | 265 da | 269 da | 255 da | 239 da | 239 | 252 | 255 | 246 | 266 | 255 | |
| Av. wt. (fall 1956) | 509 | 476 | 478 | 444 | 389 | 565 | 617 | 550 | 577 | 517 | |
| Days on feed | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | |
| Av. wt. adjusted to 18 or 30 mo. of age | | | | | | | | | | | |
| Av. gain on feed | 280 | 212 | 284 | 266 | 196 | 295 | 300 | 250 | 292 | 265 | |
| Animals slaughtered: | 5 | 6 | 8 | 4 | 3 | 4 | 6 | 8 | 4 | 48 | 36 |
| Av. age at slaughter | 419 days | 425 | 409 | 393 | 395 | 407 | 409 | 401 | 420 | 409 | 14 months |
| Av. slaughter weight | 777 | 704 | 759 | 703 | 589 | 852 | 910 | 796 | 871 | 781 | 994 |
| Av. dressing percent | 55.2 | 56.1 | 57.9 | 57.3 | 58.7 | 62.0 | 61.1 | 61.0 | 60.2 | 58.8 | 60.25 |
| A Av. carcass grade* | 11.0 | 7.5 | 7.9 | 9.8 | 9.3 | 8.5 | 7.2 | 8.5 | 8.0 | 8.7 | A. Good |

* Fed in gain test as indicated under project 607.

7 - Hi good
8 - Med. good
9 - Lo good
10 - Hi standard
11 - Med standard
12 - Lo standard

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING (or pastured for high gains)

FIRST TEST 1956-57 — Substation 23, McGregor, Texas

| Line or group designation | Here. | | Brah. | S.Gert. | Angus | Sh. | Charbray | Charolaise | Brangus | Red Poll | Beefmaster |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | | McGREGOR | | | | | |
| Breeding of calves | Here. | | Brah. | S. Gert. | Angus | Sh. | Charbray | Charoliase | Brangus | Red Poll | Beefmaster |
| | BF | Coop | BF | Coop | Coop | Coop | Coop | Coop | Coop. | Coop | Coop |
| Bulls, No. | 11 | 26 | 8 | 39 | 1 | 5 | 2 | 2 | 13 | 6 | 3 |
| Av. inbreeding (%) | | | | | | | | | | | |
| Av. weaning wt. | | 564 | 463 | 658 | 476 | 571 | 824 | 957 | 625 | 567 | 705 |
| Length feeding period | | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| Av. daily gain on test | | 2.2 | 2.1 | 2.5 | 2.2 | 2.2 | 2.8 | 3.2 | 2.1 | 2.2 | 2.4 |
| Av. type score (12 mos) | | 5.8 | 6.1 | 5.4 | 6.5 | 6.4 | 6.3 | 6.3 | 5.9 | 5.2 | 5.8 |
| Steers, No. | 8 | 22 | | 4 | | | | | | | |
| Av. weaning wt. | | 422 | | 565 | | | | | | | |
| Length feeding period | | 140 | | 140 | | | | | | | |
| Av. daily gain on test | | 2.0 | | 2.1 | | | | | | | |
| Av. type score (12 mos) | | 6.2 | | 7.0 | | | | | | | |
| Heifers, No. | 27 | 14 | 8 | 13 | | | 13 | 1 | 1 | 2 | |
| Av. weaning wt. | | 452 | 414 | 615 | | | 555 | 451 | 513 | 367 | |
| Length feeding period | | 140 | 140 | 140 | | | 140 | 140 | 140 | 140 | |
| Av. daily gain on test | | 1.7 | 1.5 | 1.9 | | | 2.2 | 1.6 | 1.7 | 1.7 | |
| Av. type score (12 mos) | | 6.3 | 5.9 | 6.5 | | | 5.8 | 4.5 | 6.5 | 4.5 | |

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING (or pastured for high gains)

FIRST TEST 1956-57 — Substation 23, McGregor, Texas

| Line or group designation | Red Brangus | 2 Cross 97 cross | | 98 cross | 1 cross | 4 cross | 13 cross | 32 cross | 51 cross |
|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | McGREGOR | | | | |
| Breeding of calves | Red Brangus | 2 cross 97 cross | | 98 cross | 1 cross | 4 cross | 13 cross | 32 cross | 51 cross |
| | Coop | Coop | Coop | Coop | BF | BF | BF | BF | BF |
| Bulls, No. | 1 | 2 | 3 | 2 | | | | | |
| Av. weaning wt. | 548 | 614 | 506 | 668 | | | | | |
| Length feeding period | 140 | 140 | 140 | 140 | | | | | |
| Av. daily gain on test | 2.4 | 2.2 | 2.5 | 2.5 | | | | | |
| Av. type score (12 mos) | 5.5 | 5.3 | 5.7 | 5.8 | | | | | |
| Steers, No. | | | | | 6 | 11 | 7 | 1 | 4 |
| Av. weaning wt. | | | | | 617 | 557 | 559 | 519 | 615 |
| Length feeding period | | | | | 140 | 140 | 140 | 140 | 140 |
| Av. daily gain on test | | | | | 2.2 | 1.8 | 1.9 | 2.1 | 2.1 |
| Av. type score (12 mos) | | | | | 6.9 | 6.1 | 6.6 | 6.5 | 6.1 |
| Heifers, No. | | | | 2 | 5 | 3 | 3 | 1 | 2 |
| Av. weaning wt. | | | | 570 | 514 | 521 | 521 | 578 | 551 |
| Length feeding period | | | | 140 | 140 | 140 | 140 | 140 | 140 |
| Av. daily gain on test | | | | 1.9 | 1.8 | 1.9 | 1.8 | 2.2 | 1.6 |
| Av. type score (12 mos) | | | | 6.3 | 6.5 | 6.7 | 6.8 | 8.0 | 6.3 |

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING (or pastured for high gains)

SECOND TEST - 1956-57 FOR McGREGOR, Substation #23, Texas

| Line or group designation | Here. | Brah. | S.Gert | Angus | Charol | 1-cross | 4-cross | 23-cross | 51 cross | Hereford |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | McGREGOR | | | | | | PanTech |
| Breeding of calves | Here. | Brah. | S.Gert | Angus | Charol | 1-cross | 4-cross | 23-cross | 51 cross | Hereford |
| Av. inbreeding (%) | 0 - | 0 | - | - | - | 0 | 0 | 0 | 0 | Unknown |
| | BF Coop | BF | Coop | Coop | Coop | BF | BF | BF | BF | |
| Bulls, No. | 2 11 | 4 | 28 | 4 | 2 | | | | | 140 |
| Av. weaning wt. | 497 | 533 | 624 | 510 | 862 | | | | | — |
| Length feeding period | 140 | 140 | 140 | 140 | 140 | | | | | 140 |
| Av. intitial test wt. | | | | | | | | | | 612 |
| Av. daily gain on test | 2.1 | 2.0 | 2.7 | 2.2 | 2.4 | | | | | 2.53 |
| Feed per cwt. gain (lbs) | | | | | | | | | | 955 |
| Concentrates | | | | | | | | | | 272 |
| Roughage | | | | | | | | | | 683 |
| Av. type score (12 mos) | 4.9 | 4.6 | 5.0 | 5.5 | 5.3 | | | | | 7.4* |
| Steers, No. | 2 | | 1 | | | 2 | 2 | 1 | | |
| Av. weaning wt. | 532 | | 540 | | | 660 | 626 | 550 | | |
| Length feeding period | 140 | | 140 | | | 140 | 140 | 140 | | |
| Av. daily gain on test | 1.9 | | 2.0 | | | 2.5 | 1.8 | 1.9 | | |
| Av. type score (12 mos) | 5.9 | | 6.0 | | | 6.7 | 5.2 | 5.3 | | |
| Heifers, No. | 2 | 5 | 4 | | 4 | | 3 | | 2 | |
| Av. weaning wt. | 558 | 490 | 574 | | 744 | | 514 | | 569 | |
| Length feeding period | 140 | 140 | 140 | | 140 | | 140 | | 140 | |
| Av. daily gain on test | 1.5 | 1.5 | 1.3 | | 1.7 | | 1.5 | | 1.5 | |
| Av. type score (12 mos) | 6.5 | 4.7 | 5.4 | | 5.9 | | 4.9 | | 6.0 | |

* 9 - Fancy
8 - Fancy minus
7 - Choice
6 - Choice minus
5 - Good
4 - Good minus
3 - Commercial
2 - Commercial minus
1 - Inferior

PERFORMANCE OF COW HERDS. 1957 CALVES.

| Line of group designation | | | | | McGREGOR | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | | | | | | |
| Breed of sire | Here | Here | Brah | Brah | Brah | Brah | S.Gert | S.Gert. | S.Gert. | S.Gert. |
| Breed of dam | Here | 3&9 cros | Brah | Here | 1 cross | 4 cross | Here. | 1 cross | 11 cross | 13 cross |
| No. cows bred | 58 | 11 | 58 | 15 | 62 | 16 | 10 | 3 | 17 | 5 |
| No. cows calving | 51 | 11 | 49 | 13 | 53 | 12 | 10 | 2 | 8 | 1 |
| No. calves raised | 41 | 7 | 34 | 10 | 46 | 11 | 8 | 2 | 7 | 1 |
| Av. inbr. of dams (%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Av. inbr. of calves (%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Av. birth date | 2/18/57 | 2/1/57 | 3/3/57 | 2/22/57 | 2/22/57 | 3/22/57 | 3/3/57 | 4/27/57 | 2/10/57 | 3/26/57 |
| Av. birth wt. (lbs) | 76 | 78 | 68 | 92 | 79 | 77 | 74 | 65 | 76 | 65 |
| Bulls | 76 | 80 | 70 | 98 | 82 | 80 | 86 | 59 | 82 | — |
| Heifers | 75 | 77 | 66 | 82 | 77 | 73 | 69 | 70 | 70 | 65 |
| Were calves creep fed? | No | No | No | No | No | No | No | No | No | No |
| Av. wt. at six mos. (lbs) | 375 | 439 | 386 | 445 | 443 | 402 | 419 | 408 | 406 | 355 |
| Bulls | 385 | | 400 | | 478 | 458 | | | | |
| Steers | 361 | 441 | | 450 | 454 | 395 | 485 | 407 | 397 | |
| Heifers | 375 | 434 | 368 | 431 | 431 | 397 | 402 | 409 | 419 | 355 |
| Av. weaning date | 8/15/57 | 7/31/57 | 8/31/57 | 8/21/57 | 8/27/57 | 9/18/57 | 8/23/57 | 10/24/57 | 8/31/57 | 9/22/57 |
| Bulls | 8/18 | | 8/26 | | 10/3 | 10/13 | | | | |
| Steers | 8/8 | 7/29 | | 8/18/ | 8/18 | 10/3 | 8/1 | 10/7 | 8/16 | |
| Heifers | 8/13 | 8/6 | 9/5 | 8/29 | 8/23 | 8/29 | 8/30 | 11/10 | 9/20 | 9/22 |
| No calves slaughtered at weaning. | | | | | | | | | | |

# PERFORMANCE OF COW HERDS. 1957 CALVES

| Line of group designation | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | McGREGOR | | | | | | Old A Herd | Old B Herd | Old C Herd | Old F Herd |
| | | | | | | | ParTech Farms | | | |
| Breed of sire | S. Gert. | St.Gert. | Charol | Charol | Charol | S.Gert. | Here. | Here. | Here. | Here. |
| Breed of dam | Red Poll | 14 cross | Charb. | Here. | 1 cross | S.Gert. | Here. | Here. | Here. | Here. |
| No. of cows bred | 14 | 3 | 24 | 10 | 8 | 31 | 25 | 24 | 24 | 23 |
| No. cows calving | 8 | 3 | 10 | 6 | 2 | 18 | 24 | 22 | 21 | 23 |
| No. calves raised | 6 | 2 | 7 | 4 | 2 | 18 | 22 | 22 | 17 weaned 3 sold before weaning | 21 weaned 2 sold before weaning |
| Av. birth date | 2/28/57 | 1/22/57 | 3/23/57 | 4/2/57 | 2/3/57 | 3/20/57 | 3/22/57 | 2/17/57 | 2/25/57 | 2/23/57 |
| Av. birth wt. (lbs) | 89 | 83 | 99 | 99 | 90 | 68 | | | | |
| Bulls | 93 | 90 | 110 | 113 | — | 72 | | | | |
| Heifers | 80 | 80 | 83 | 92 | 90 | 67 | | | | |
| Were calves creep fed? | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| Av. wt. at six mos. (lbs) | 471 | 481 | 513 | 451 | 501 | | | | | |
| Bulls | | | 531 | | | | | | | |
| Steers | 494 | | | 558 | | | | | | |
| Heifers | 426 | 481 | 500 | 415 | 501 | | | | | |
| Av. weaning date | 8/31 | 7/21 | 9/20 | 9/29 | 8/2 | | All calves were weaned Nov. 12, 1957. | | | |
| Bulls | | | 10/1 | | | | | | | |
| Steers | 9/8 | | | 9/3 | | | | | | |
| Heifers | 8/4/ | 7/21 | 9/11 | 10/7 | 8/2 | | | | | |
| Av. weaning wt. | | | | | | | (adjusted to 205 days of age) | | | |
| Steers | | | | | | | 498 | 502 | 501 | 452 |
| Heifers | | | | | | | 461 | 460 | 467 | 439 |
| Av. weaning type score* | | | | | | | | | | |
| Steers | | | | | | | 7.80 | 7.60 | 7.67 | 7.5 |
| Heifers | | | | | | | 7.75 | 7.67 | 8.00 | 8.0 |

* 9 - Fancy
8 - Fancy minus
7 - Choice minus
6 - Choice minus
5 - Good
4 - Good minus
3 - Commercial
2 - Commercial minus
1 - inferior

VIRGINIA STATION

I. Project Title: No. 93091.

Heterosis From Crosses Among British Breeds of Beef Cattle.

II. Objectives:

A. To measure heterosis obtained from crosses among Angus, Hereford, and Shorthorn beef cattle as shown by growth rate, fattening ability, and carcass quality up to approximately 20 months of age.

B. To measure productive ability of dams.

III. Accomplishments During the Year:

A. 1. All the cows were moved to the Shenandoah Valley Research Station, Steeles Tavern, Virginia.

2. First calf crop was born in spring, 1957.

3. Mating groups for 1957 are as shown in accompanying table.

B. Research Results - see accompanying summary table. Calves were weaned October 5, 1957, and steers were moved to Blacksburg.

IV. Future Plans:

A. Weaning of all calves born in 1958 will be accomplished about October 15. The heifer calves will remain at Steeles Tavern and be put on feed the day they are weaned and full fed in eight lots on a standard ration until the top end grade choice as slaughter cattle. Steer calves will be castrated soon after birth. They will be moved to Blacksburg at weaning time and remain there until they are sold for slaughter as two year old steers.

B. Birth weights will be recorded, and subsequent weights will be obtained at 28 day intervals.

C. Slaughter grades on all calves will be obtained.

D. Records of feed consumption of each lot will be kept.

V. Publications During the Year:

None.

VI. Publications Planned:

None.

Table I. Mating Groups, Spring 1957

| Bulls: | Angus | Hereford | Shorthorn | AXH | AXS | HXS |
|---|---|---|---|---|---|---|
| Cow No's. | 1 | 4 | 5 | 6 | 2 | 3 |
| | 11 | 9 | 10 | 12 | 7 | 8 |
| | 17 | 13 | 14 | 15 | 19 | 16 |
| | 22 | 20 | 24 | 21 | 23 | 25 |
| | 28 | 27 | 29 | 30 | 26 | 31 |
| | 32 | 45 | 41 | 44 | 42 | 33 |
| | 34 | 51 | 49 | 47 | 48 | 35 |
| | 36 | 58 | 54 | 55 | 57 | 37 |
| | 39 | 61 | 63 | 59 | 60 | 38 |
| | 43 | 66 | 69 | 68 | 67 | 40 |
| | 50 | 72 | 84 | 81 | 71 | 46 |
| | 53 | 74 | 89 | 92 | 73 | 52 |
| | 64 | 75 | 98 | 97 | 76 | 56 |
| | 70 | 77 | 104 | 102 | 78 | 62 |
| | 85 | 80 | 110 | 106 | 79 | 65 |
| | 88 | 86 | 112 | 113 | 83 | 82 |
| | 94 | 91 | 115 | 114 | 93 | 87 |
| | 101 | 95 | 117 | 116 | 99 | 96 |
| | 107 | 103 | 118 | 119 | 100 | 105 |
| | | 108 | 120 | | 109 | 111 |

Note: 1-40 are Angus, 41-80 are Hereford; 81-120 are Shorthorn.

TABLE II

October, 1957

SUMMARY, CROSSBREEDING PROJECT, McCORMICK STATION

| | Cows Bred | Calves Born | Dead at Birth | Died | Calves Raised to Weaning | Diff. Part. | Average Birth Date | Average Birth Weight | Av. Da. Gain Birth to Weaning | Feeder Grade at Weaning * | Average Six Mo's. Weight | Average Weaning Weight (5 Oct.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Purebred | | | | | | | | | | | | |
| A x A | 10 | 7 | 0 | 1 | 6 | 0 | 17 Apr | 61.4 | 1.54 | 12.2 | 335 | 307 |
| H x H | 10 | 9 | 1 | 0 | 8 | 1 | 29 Mar | 66.9 | 1.02 | 8.7 | 279 | 266 |
| S x S | 10 | 6 | 0 | 0 | 6 | 0 | 13 Feb | 74.7 | 1.30 | 12.1 | 355 | 378 |
| Total or Av. | 30 | 22 | 1 | 1 | 20 | 1 | 21 Mar | 66.4 | 1.26 | 10.8 | 318 | 312 |
| 2 Breed Crosses | | | | | | | | | | | | |
| A x H | 5 | 5 | 1 | 0 | 4 | 0 | 4 May | 65.5 | 1.23 | 10.6 | 307 | 255 |
| A x S | 5 | 5 | 0 | 0 | 5 | 0 | 2 May | 62.0 | 1.25 | 11.5 | 268 | 260 |
| H x A | 5 | 4 | 1 | 0 | 3 | 3 | 19 Feb | 69.0 | 1.37 | 10.5 | 324 | 381 |
| H x S | 5 | 4 | 1 | 0 | 3 | 0 | 27 Feb | 72.3 | 1.32 | 10.2 | 369 | 353 |
| S x A | 5 | 5 | 1 | 0 | 4 | 3 | 3 Mar | 71.5 | 1.46 | 12.1 | 388 | 376 |
| S x H | 5 | 4 | 0 | 0 | 4 | 0 | 12 Feb | 71.2 | 1.15 | 10.7 | 328 | 348 |
| Total or Av. | 30 | 27 | 4 | 0 | 23 | 6 | 19 Mar | 68.6 | 1.29 | 11.0 | 338 | 322 |
| 3 Breed Crosses | | | | | | | | | | | | |
| (AxH) x S | 10 | 7 | 0 | 0 | 7 | 0 | 15 Feb | 60.8 | 1.34 | 11.1 | 370 | 372 |
| (AxS) x H | 10 | 9 | 0 | 0 | 9 | 0 | 14 Feb | 65.1 | 1.20 | 10.2 | 326 | 344 |
| (HxS) x A | 10 | 9 | 0 | 0 | 9 | 1 | 11 Feb | 59.4 | 1.30 | 10.3 | 324 | 366 |
| Total or Av. | 30 | 25 | 0 | 0 | 25 | 1 | 13 Feb | 61.9 | 1.28 | 10.5 | 345 | 360 |
| Backcross | | | | | | | | | | | | |
| (AxS) x A | 5 | 4 | 0 | 0 | 4 | 1 | 30 Mar | 61.8 | 1.22 | 10.1 | 301 | 293 |
| (AxH) x A | 5 | 5 | 0 | 1 | 4 | 0 | 19 Feb | 59.6 | 1.31 | 9.5 | 341 | 350 |
| (HxS) x H | 5 | 4 | 0 | 0 | 4 | 0 | 7 Mar | 74.8 | 1.23 | 10.0 | 328 | 339 |
| (AxH) x H | 5 | 5 | 0 | 0 | 5 | 3 | 23 Feb | 64.4 | 1.12 | 8.9 | 307 | 314 |
| (HxS) x S | 4 | 3 | 0 | 0 | 3 | 0 | 16 Feb | 65.0 | 1.33 | 10.9 | 303 | 372 |
| (AxS) x S | 4 | 3 | 0 | 1 | 2 | 0 | 21 Mar | 63.7 | 1.34 | 11.0 | 328 | 308 |
| Total or Av. | 28 | 24 | 0 | 2 | 22 | 2 | 4 Mar | 64.7 | 1.24 | 9.9 | 317 | 329 |
| Total | 118 | 98 | 5 | 3 | 90 | 10 | 7 Mar | 65.3 | 1.27 | 10.5 | 330 | 332 |

* Grade Code: Fancy 15-17; Choice 12-14; Good 9-11; Medium 6-8.

**Table III**

BEEF CATTLE CROSSBREEDING PROJECT

PERFORMANCE OF COW HERDS. 1957 CALVES

Shenandoah Valley Station

| Line of group designation<br>Location<br>Breed of sire | Purebred | 2 breed cross | 3 breed cross | Backcross |
|---|---|---|---|---|
| | | STEELES TAVERN | | |
| No. cows bred | 30 | 30 | 30 | 28 |
| No. cows calving | 22 | 27 | 25 | 24 |
| No. calves raised | 20 | 23 | 25 | 22 |
| Av. birth date | 3/21 | 3/19 | 2/13 | 3/4 |
| Av. birth wt. (lbs) | | | | |
| Bulls | 66.9 | 69.9 | 62.9 | 67.2 |
| Heifers | 66.0 | 67.9 | 60.9 | 61.7 |
| Were calves creep fed? | no | no | no | no |
| Av. wt. at six months (lbs) | | | | |
| Steers | 319 | 320 | 350 | 324 |
| Heifers | 317 | 358 | 340 | 308 |
| Av. weaning date: | | | | |
| Steers | 10/5/57 | 10/5/57 | 10/5/57 | 10/5/57 |
| Heifers | 10/5/57 | 10/5/57 | 10/5/57 | 10/5/57 |
| Av. weaning wt. | | | | |
| Steers | 315 | 335 | 367 | 342 |
| Heifers | 310 | 314 | 353 | 313 |
| Av. weaning type score:* | | | | |
| Steers | 10.4 | 11.0 | 10.7 | 10.9 |
| Heifers | 11.1 | 11.0 | 10.3 | 8.6 |
| Av. daily gain: | | | | |
| Steers | 1.26 | 1.36 | 1.29 | 1.28 |
| Heifers | 1.26 | 1.25 | 1.26 | 1.20 |
| Calves slaughtered at weaning: | | NONE | | |

* Feeder grade; grade code: Fancy 15-17; Choice 12-14; Good 9-11; Medium 6-8.

I. Project Title: Project No. S.031-AH 551 (S-10 Contributing).

A Study of Dwarfism in Beef Cattle.

II. Objectives:

A. To investigate further the hereditary nature of dwarfism in beef cattle.

B. To determine whether the same mechanisms are responsible for the different types of dwarfism among different breeds.

C. To determine the gene frequency for dwarfism in Virginia.

D. To discover, if possible, the abnormal physiological action of the dwarf gene.

E. To find some method or procedure whereby the heterozygous animals may be accurately identified in order that the dwarf gene can be controlled or eliminated from the breeding herds.

III. Accomplishments During the Year:

A. Facilities and cattle.

(1) Ten dwarf females and three males of Hereford, Angus and Hereford x Angus breeding were put into the original breeding herd. Three Hereford females died prior to breeding. PD10 died of heart failure following pneumonia in November 1955. PD11 died of pneumonia in November 1956. Two animals given out to the Experiment Station as dwarfs (NC15 and No. 9) turned out to be normal, but were kept in the breeding herd.

Bulls (1 Angus, 1 Hereford and 1 AxH) were put in with the heifers on May 29, 1956.

A pregnancy check was made on December 5, 1956 and all females were diagnosed pregnant except C16. NC15 was observed in heat on December 31, 1956.

(2) Several breeders of purebred Hereford and Angus cattle have been cooperating in an attempt to find some means by which progenies of known carrier sires may be segregated into carrier and non-carrier groups. Segregation criteria included:

(a) Growth patterns from observations obtained at approximately three months intervals as follows:

(1) Body measurements, including height and chest circumference.
(2) Birth weight and periodic body weights from birth to maturity.
(3) Type scores, masculinity scores on young bulls, and/or other subjective characteristics which appear promising.

(4) Data have been collected from herds in the Virginia BCIA performance testing program which will be used to (1) obtain estimates of the gene frequency for dwarfism and (2) study of the variation in type and degree of expression of dwarfism.

(3) Cattle with known breeding records in the V.P.I. herds have been used for blood studies of various kinds.

B. Research Results.

(1) Pathological studies: Necropsies were performed on 23 dwarf and 9 normal calves ranging in age from approximately 1 to 24 months for the dwarfs and 1 to 12 months for the normal calves.

(a) Gross abnormalities.

Several gross abnormalities were observed in bone formation, including (1) various degrees of bulging of the frontal bones of the skull, (2) pinched occipital condyles, (3) shortened and/or thickened long bones, and (4) shortened lumbar vertebrae with irregular ventral surfaces and shortened transverse processes. There were varying degrees of hydrocephalus associated with the pinched occipital condyles and bulging frontal bones, however, no excessive spinal fluid pressure was apparent in any of the calves checked. Associated with the hydrocephalus and bulging of the frontal bones was varying degrees of brain atrophy.

Nasal passages, bronchi and lungs were checked in an effort to determine the cause of labored breathing in dwarf calves. The only abnormality observed was the excessive curviture of the nasal passages. Apparently the loud breathing results from mechanical movement of air through the crooked passages.

(b) Histological studies

Approximately 100 slides were prepared of various glands and tissues for histological studies, including the brain, liver, spleen, thymus, thyroid, pituitary, adrenals, gonads, kidneys and sections of the intestines, spinal cord, bone and muscle fibers. There were no apparent histological abnormalities observed in these slides.

(c) Gland weights.

Gland weights were obtained on several dwarf and normal calves. A comparison of thyroid weights is shown in Table I. Weights of pituitaries and glandular pituitary powder from dwarf and normal calves are shown in Table II.

When consideration was given to differences in breed, sex, age and/or weight of calf, glands from dwarf calves were not smaller than those from normal calves.

TABLE I. THYROID WEIGHTS OF DWARF AND NORMAL BEEF CALVES

| CLASSIFICATION | No. of Calves | Av. Calf Age (mos.) | Av. Calf wt. | THYROID WEIGHTS IN MGMS. Actual | Per 100# Live Body Wt. |
|---|---|---|---|---|---|
| Normal Calves | | | | | |
| Hereford | 11 | 4.6 | 306 | 7.54 | 2.46 |
| Angus | 7 | 4.6 | 307 | 7.00 | 2.28 |
| Dwarf Calves | | | | | |
| Hereford | 37 | 3.1 | 115 | 6.14 | 5.33 |
| Angus | 14 | 4.2 | 155 | 11.84 | 7.65 |

TABLE II. WEIGHT OF PITUITARIES AND GLANDULAR PITUITARY POWDER FROM DWARF AND NORMAL BEEF CALVES

| CLASSIFICATION | No. of Calves | Av. Calf Age (mos.) | Av. Calf Wt. | Wt. of Pituitary Mgms. | Per 100 lbs live weight |
|---|---|---|---|---|---|
| | | | PITUITARY GLANDS | | |
| Dwarf Calves | 49 | 3.3 | 125 | 480 | 384 |
| Normal Calves | 22 | 4.7 | 327 | 1027 | 324 |
| | | | GLANDULAR POWDER | | |
| Dwarf Calves | 66 | 4.3 | 172 | 113 | 65.7 |
| Normal Calves | 33* | 4.3 | 299 | 155 | 51.9 |

* These normal calves were all under 7 months of age.

(2) Blood Studies

Blood samples from groups of dwarf and normal calves have been analyzed for protein-bound iodine, glucose, calcium, phosphorous, magnesium and phosphatase activity. No significant differences were found between these groups in any of these blood constituents. One small group of calves of the various genotypes (dwarf, carrier, and clean) were checked for sensitivity to insulin stress as measured by change in total and differential WBC counts. No significant differences were observed among groups.

(3) Measurement Data

Growth data, type score and body measurements have been obtained on more than one thousand calves sired by 50 known carrier bulls. These data are ready for analysis. Masculinity scores have been assigned to all bull calves tested through the Virginia BCIA during the last three years. Many of these bulls are now siring calves in participating herds and data are being collected so that masculinity scores may be related to breeding records.

(4) Dose - response curves have been established for growth hormone potency for both air-dried and acetone dried pituitary glands. Two additional assays for growth hormone potency of pituitaries from dwarf and normal calves were conducted. There is some indication of a growth hormone deficiency in the dwarf glands.

IV. Future Plans:

A. Our research program on dwarfism has been limited because of insufficient funds for hiring both technical and non-technical help and equipment. There is some hope of obtaining outside funds for this project. If these funds are forthcoming, the committee for dwarfism research proposes three approaches to the problem:

(1) Continuation of the investigation to determine if a growth hormone deficiency exist.

(2) Investigate possible uses of stressor agents as a means of detecting the presence of the dwarf gene.

(3) Investigate early embryological and fetal development with special attention to early pathological conditions that might shed light on the action of the dwarf gene. This phase will include study of the sperm, egg, and cleavage, provided sufficient funds become available.

B. The dwarf breeding herd will be maintained for at least one more calf crop. All dwarf cows have been rebred to dwarf bulls for late spring calving. If additional funds become available the herd will be maintained to produce the embryos and fetuses needed for phase (3) of the above proposed study.

C. Analysis of field observations is planned.

V. Publications During the Year:

None.

VI. Publications Planned:

This will depend on the progress made in the study.

I. Project Title: Project No. S.031-AH 542.

Performance Testing of Beef Cattle on Virginia Farms.

II. Objectives:

A. To develop a state-wide on-the-farm testing program for beef cattle in Virginia in which the major emphasis shall be placed on selection criteria for such economically important traits as regular reproduction, heavy weaning weights, milking and mothering ability, ability to gain rapidly after weaning, desirable type and conformation, and longevity.

B. To investigate means of handling the field work through local personnel so that a large percentage of the breeding herds in Virginia could be included without requiring extensive travel and field work by personnel directing the program and handling the analyses of data.

C. To identify some of the non-genetic factors such as sex of calf, age of dam and nutritional level in order to develop methods of more precisely estimating true genetic differences among individuals and groups.

D. To obtain data from purebred and commercial herds handled under farm conditions in order to develop practical means of improving beef cattle through breeding methods.

E. To determine the effectiveness of selection in the improvement of beef cattle under farm conditions.

III. Accomplishments During the Year:

A. Calves and yearling cattle were tested on 112 Virginia farms in 1957. These included 65 Angus, 43 Hereford and 4 Shorthorn herds. Approximately 4,000 calves and 500 yearling cattle were weighed, graded and indexed. The exact number has not been determined because a few herds are still to be done. A complete report can not be made until all herds have been tested.

B. Each breeder participating in the on-the-farm performance testing program has been or will be furnished in the near future the following information;

(1) An IBM listing by sire progeny groups of all his 1957 calves

which showed the age, weight, type score, average daily gain from birth, gain adjusted for sex of calf, season of birth and age of dam, and the index value for each calf.

(2) An IBM listing by dams showing the performance of each calf produced and the average performance of all her calves since she was entered in the program.

(3) An IBM listing showing the number and average performance of each sire progeny group by years and all years combined.

(4) A copy of the 1957 report of all cattle tested in the state. This report showed the average performance of all calves by each sire as well as the herd average. Herds in which calves were creep fed and/or nurse cows were used were listed separately from the non-creep fed herds.

C. At two breed association sponsored sales in 1957 the cattle were weighed and graded on the morning of the sale. Performance data were made available to all interested persons and also used by the auctioneer.

D. The Virginia Beef Cattle Improvement Association, organized in January, 1955, now has 120 active members. Their second annual meeting was held in February, 1957, with approximately 50 persons in attendance.

E. Performance records of cattle tested during 1953 through 1956 were used to study the influence of sex, age and season of birth of calf and age of dam on preweaning growth rate and type score. Least squares estimates of these effects for non-creep fed calves are shown in Table I. These estimates were used to arrive at weight adjustment factors for use in 1957, and are shown in Tables II and III. The effectiveness of the adjustment factors in adjusting the growth rate of all calves to a common base (a steer calf born between Jan. 1 and May 31 and out of a 6-10 year old cow) is shown in Table IV. They were rather effective in removing differences due to sex of calf and age of cow. They were less effective in removing differences due to season of birth. No correction was applied for age of calf and it appears that none was needed except for calves in the 271 to 300 day age group.

F. Educational phase of the program was stressed in 1957. The program was presented to the American Aberdeen-Angus Conference, East Lansing Michigan; American Beef Cattle Performance Registry Association, Louisville, Kentucky; S-10 Technical Committee, Gainesville, Florida; six district meetings of County Agents and to several livestock groups in Virginia.

## IV. Future Plans:

Program will be expanded to take in additional breeders. Plans are underway to establish committees in concentrated areas to supervise the program locally, hire local personnel to handle the field work, and to make recommendations to the state organization. Procedures for handling performance data on IBM cards are being changed to make them more flexible and cut down on the amount of handling and coding required. The 1958-59 budget request includes a full time extension specialist

who will become the state supervisor of performance testing. He will be responsible for all routine collecting, computing, and reporting of performance records. This will allow the project leader more time for the research phases of the program.

V. Publications During the Year:

Marlowe, Thomas J. and James A. Gaines. 1957. The Influence of Age and Sex of Calf on Preweaning Growth Rate and Type Score in Beef Calves. Proc. Assoc. Sou. Agri. Workers, February 1957.

Marlowe, Thomas J. and James A. Gaines. 1957. The Influence of Age, Sex, and Season of Birth of Calf and Age of Dam on Preweaning Growth Rate and Type Score of Beef Calves. J. of Ani. Sci. 16:1019. (Abstract).

Performance Testing of Beef Cattle on the Farm. V. P. I. Agri. Ext. Serv. Cir. 723. March, 1957.

Marlowe, Thomas J. 1957. The Virginia System for Performance Testing Beef Cattle on the Farm. The Aberdeen-Angus Journal. June 1957.

Marlowe, Thomas J. 1957. Meaningful Weight Gains in Beef Cattle. The Breeder-Stockman. July 1957.

Marlowe, Thomas J. 1957. Performance of 4,200 Cattle Measured in Virginia During 1956. The Breeder-Stockman. March 1957.

Marlowe, Thomas J. 1957. Importance of the Virginia BCIA Performance Testing Program. Virginia Angus Topics. January 1957.

VI. Publications Planned:

Marlowe, Thomas., Charles M. Kincaid and G. W. Litton, 1958. Virginia Beef Cattle Performance Testing Program. Va. Agri. Exp. Sta. Bul.

Table I. LEAST SQUARES ESTIMATES OF THE EFFECTS OF AGE, SEX, AND SEASON OF BIRTH OF CALF AND AGE OF COW ON PRE-WEANING GROWTH RATE AND TYPE SCORE OF NON-CREEP FED BEEF CALVES

| Effects Studied | Number of Calves | Average Daily Gains | | | Average Type Scores[2] | | |
|---|---|---|---|---|---|---|---|
| | | Unadjusted Means | Least Squares Estimate | Adjusted Means | Unadjusted Means | Least Squares Estimate | Adjusted Means |
| Age of Calf (Days) | | | | | | | |
| 90 - 120 | 201 | 1.69 | 0.03 ± .02 | 1.69 | 10.67 | -0.77 ± .13 | 10.86 |
| 121 - 150 | 607 | 1.70 | 0.02 ± .01 | 1.68 | 11.16 | -0.39 ± .10 | 11.24 |
| 151 - 180 | 932 | 1.70 | 0.01 ± .01 | 1.67 | 11.42 | -0.23 ± .08 | 11.40 |
| 181 - 210 | 1074 | 1.66 | 0.00 ± | 1.66 | 11.63 | 0.00 | 11.63 |
| 211 - 240 | 785 | 1.63 | -0.02 ± .01 | 1.64 | 11.85 | 0.22 ± .09 | 11.85 |
| 241 - 270 | 459 | 1.54 | -0.06 ± .02 | 1.60 | 11.57 | 0.01 ± .11 | 11.64 |
| 271 - 300 | 108 | 1.42 | -0.17 ± .03 | 1.49 | 11.41 | -0.08 ± .19 | 11.55 |
| Season of Birth[1] | | | | | | | |
| Dec 16-Mar 15 | 2163 | 1.65 | 0.00 | 1.65 | 11.67 | 0.00 | 11.67 |
| Mar 16-May 31 | 1425 | 1.70 | 0.04 ± .01 | 1.69 | 11.29 | -0.07 ± .08 | 11.60 |
| Jun 1-Aug 31 | 146 | 1.54 | -0.09 ± .02 | 1.56 | 10.55 | -0.93 ± .16 | 10.74 |
| Sep 1-Dec 15 | 432 | 1.50 | -0.12 ± .02 | 1.53 | 11.66 | -0.05 ± .11 | 11.62 |
| Sex of Calf | | | | | | | |
| Bulls | 511 | 1.79 | 0.07 ± .01 | 1.77 | 11.72 | 0.63 ± .09 | 11.84 |
| Heifers | 2115 | 1.58 | -0.12 ± .01 | 1.58 | 11.66 | 0.48 ± .06 | 11.69 |
| Steers | 1540 | 1.70 | 0.00 | 1.70 | 11.21 | 0.00 | 11.21 |
| Age of Dam (Years) | | | | | | | |
| 0 - 2.5 | 311 | 1.46 | -0.30 ± .02 | 1.44 | 10.72 | -0.86 ± .13 | 10.91 |
| 2.5 - 3.5 | 607 | 1.58 | -0.17 ± .02 | 1.57 | 11.29 | -0.40 ± .11 | 11.37 |
| 3.5 - 4.5 | 657 | 1.63 | -0.11 ± .02 | 1.63 | 11.41 | -0.32 ± .11 | 11.45 |
| 4.5 - 5.5 | 655 | 1.66 | -0.08 ± .02 | 1.66 | 11.62 | -0.11 ± .11 | 11.66 |
| 5.5 - 6.5 | 525 | 1.70 | -0.04 ± .02 | 1.70 | 11.80 | 0.10 ± .11 | 11.67 |
| 6.5 - 7.5 | 408 | 1.74 | 0.00 | 1.74 | 11.77 | 0.00 | 11.77 |
| 7.5 - 8.5 | 275 | 1.68 | -0.06 ± .02 | 1.68 | 11.68 | -0.07 ± .14 | 11.70 |
| 8.5 - 9.5 | 217 | 1.73 | -0.01 ± .02 | 1.73 | 11.42 | -0.31 ± .15 | 11.46 |
| Over 9.5 | 514 | 1.67 | -0.07 ± .02 | 1.67 | 11.57 | -0.26 ± .12 | 11.51 |
| Total and Means | 4166 | 1.65 | 1.81 ± .02 | 1.71 | 11.50 | 11.57 ± .11 | 11.70 |

1. Average birth date by groups was Feb. 6, Apr. 13, July 7 and Oct. 20, respectively.
2. Type Score Code: Fancy 15-17; Choice 12-14; Good 9-11; Medium 6-8; Common 3-5.

Marlowe and Gaines
Va. Agri. Expt. Sta.

Table II. 1957 WEIGHT ADJUSTMENT FACTORS FOR VIRGINIA BCIA PERFORMANCE TESTING PROGRAM

| Age of Dam | WAF | Age of Calf | WAF |
|---|---|---|---|
| 2 | 1.20 | (1) 90-120 | 1.00 |
| 3 | 1.10 | (2) 121-150 | 1.00 |
| 4 | 1.06 | (3) 151-180 | 1.00 |
| 5 | 1.04 | (4) 181-210 | 1.00 |
| 6-10 | 1.00 | (5) 211-240 | 1.00 |
| 11-13 | 1.05 | (6) 241-270 | 1.03 |
| 14 & over | 1.15 | (7) 271-300 | 1.10 |
| **Season of Birth** | **WAF** | **Sex of Calf** | **WAF** |
| (1) Jan. 1 - May 31 (1 - 151 day) | 1.00 | (1) Bulls | 0.96 |
| (2) June 1 - Dec. 31 (152 - 365 day) | 1.06 | (2) Heifers | 1.07 |
| | | (3) Steers | 1.00 |

Table III. COMBINATIONS OF WAF'S FOR INFLUENCE AGE OF DAM, SEX OF CALF, AND SEASON OF BIRTH

| Sex of Calf | | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|---|
| Season of Birth | | 1 | 2 | 1 | 2 | 1 | 2 |
| Age of Dam | 2 | 1.15 | 1.22 | 1.27 | 1.36 | 1.20 | 1.27 |
| | 3 | 1.06 | 1.12 | 1.17 | 1.25 | 1.10 | 1.17 |
| | 4 | 1.02 | 1.08 | 1.13 | 1.20 | 1.06 | 1.12 |
| | 5 | 1.00 | 1.06 | 1.11 | 1.18 | 1.04 | 1.10 |
| | 6-10 | 0.96 | 1.02 | 1.07 | 1.13 | 1.00 | 1.06 |
| | 11-13 | 1.00 | 1.07 | 1.12 | 1.19 | 1.05 | 1.11 |
| | 14 plus | 1.10 | 1.17 | 1.22 | 1.30 | 1.15 | 1.22 |

Table IV. WEIGHT ADJUSTMENT FACTORS APPLIED TO 1957 CALVES

Sex of Calf

| Sex | Number | Daily Gains |
|---|---|---|
| Bulls | 242 | 1.76 |
| Heifers | 1512 | 1.73 |
| Steers | 1393 | 1.74 |
| Total | 3147 | 1.74 |

Season of Birth of Calf

| Season | Number | Daily Gains |
|---|---|---|
| Jan. 1 - May 31 | 2460 | 1.75 |
| June 1 - Dec. 31 | 687 | 1.69 |
| | 3147 | 1.74 |

Age of Calf in Days*

| Age | Number | Daily Gains |
|---|---|---|
| 90-120 | 164 | 1.78 |
| 121-150 | 464 | 1.78 |
| 151-180 | 575 | 1.79 |
| 181-210 | 802 | 1.75 |
| 211-240 | 686 | 1.67 |
| 241-270 | 321 | 1.70 |
| 271-300 | 135 | 1.62 |
| Total | 3147 | 1.74 |

Age of Cow in Years

| Age | Number | Daily Gains |
|---|---|---|
| 0-2.5 | 226 | 1.75 |
| 2.5-3.5 | 393 | 1.72 |
| 3.5-4.5 | 489 | 1.71 |
| 4.5-5.5 | 380 | 1.77 |
| 5.5-6.5 | 420 | 1.74 |
| 6.5-7.5 | 264 | 1.71 |
| 7.5-8.5 | 250 | 1.73 |
| 8.5-9.5 | 162 | 1.73 |
| Over 9.5 | 359 | 1.77 |
| | 2943 | 1.74 |

*No adjustment made for age of calf.

SUPPLEMENT: Northern Virginia Pasture Research Station

The Northern Virginia Pasture Research Station, Middleburg, Virginia, maintains a purebred Aberdeen Angus herd of approximately 55 cows and 3 herd sires. These cows were purchased as weanling calves in the fall of 1949 in lots of half sibs from 8 herds in Virginia and Maryland. The entire calf crop is used each year in connection with grazing experiments on the station. All male calves remain as bulls until weaned when all are castrated except two or three of the top calves which show promise of becoming herd sires. Cows are bred to calve during June, July, and August in order that calves may be weaned in time for the beginning of the grazing tests around the first of April. The average calving date for 1956 was July 17.

Performance records were obtained on 46 calves dropped in 1956 and weaned March 8, 1957. These calves were by four sires and the average values for each progeny group are shown in Table I below.

TABLE I. PREWEANING PERFORMANCE OF 1956 CALVES BY SIRE PROGENY GROUPS

| Sire No. | Number Calves | Age in Days | 3/8/57 Weight | Av. Daily Gain | Adj. Daily Gain [1] | Type Score [2] | Index Value |
|---|---|---|---|---|---|---|---|
| 364 | 7 | 223 | 539 | 2.05 | 2.16 | 11.0 | 123 |
| 374 | 7 | 223 | 403 | 1.55 | 1.76 | 10.6 | 105 |
| 384 | 7 | 236 | 457 | 1.65 | 1.90 | 12.1 | 118 |
| WA22 | 25 | 237 | 471 | 1.74 | 1.88 | 11.5 | 114 |
| Total or Av. | 46 | 232 | 469 | 1.75 | 1.91 | 11.4 | 115 |

[1]Gains adjusted for sex of calf, season of birth and age of dam.

[2]Type score code: Fancy 15-17; Choice 12-14; Good 9-11; Medium 6-8.

All bull calves except two were castrated immediately following weaning and after a short interval all calves were put on the grazing plots. Post-weaning performance was obtained for a 235 day period from March 8 through October 29. The weaning weight was used as the beginning weight and the final weight taken on October 29. The summer performance of these calves on grass by sire progeny groups are shown in Table II.

TABLE II. POSTWEANING PERFORMANCE OF 1956 CALVES BY SIRE PROGENY GROUPS

| Sire No. | Number Calves | Age in Days | Weight 10/29/57 | Summer Gains | Average Daily Gains | Type Score | Index Value |
|---|---|---|---|---|---|---|---|
| 364 | 7 | 458 | 779 | 258 | 1.10 | 11.6 | 81 |
| 374 | 7 | 458 | 589 | 186 | 0.79 | 12.0 | 75 |
| 384 | 7 | 471 | 660 | 203 | 0.86 | 11.9 | 75 |
| WA22 | 25 | 472 | 719 | 247 | 1.06 | 12.2 | 86 |

The heifers gained an average of 179 pounds or 0.76 pound per day and the steers 285 pounds or 1.21 pounds per day during the 235 day pasture period.

PERFORMANCE OF COW HERDS. 1957 CALVES.

Northern Virginia Pasture Research Station

| Location | Middleburg, Virginia | | |
|---|---|---|---|
| Breed of sire | Angus | | |
| Breed of dam | Angus | | |
| No. cows calving | 47 | | |
| No. calves raised | 47 | 23 bulls | 24 heifers |
| Av. inbr. of dams (%) | Not calculated | | |
| Av. inbr. of calves (%) | Not calculated | | |
| Av. birth date | 7/17/56 | | |
| Av. birth wt. (lbs) | 67.7 | | |
| Bulls | 59.8 | | |
| Were calves creep fed? | No | | |
| Av. wt. at 6 mos. (lbs) | | | |
| Bulls 1.91 | 411 | 180 days | |
| Heifers 1.60 | 348 | | |
| Av. weaning date | 3/8/57 | | |
| Av. weaning wt. | | | |
| Bulls | 507 | | |
| Heifers | 434 | | |
| Av. weaning type score | | | |
| Bulls | 11.6 | | |
| Heifers | 11.2 | | |
| Av. weaning condition score: | None given | | |
| Calves slaughtered at weaning: | NONE | | |

# PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE NOT INCLUDED IN BREEDING HERDS IN 1957

Northern Virginia Pasture Research Station

| Line or group designation | FALL 1956 | | FALL 1957 | |
|---|---|---|---|---|
| Breeding | Angus | Hereford | Angus | Hereford |
| Sex: | | | | |
| No. | 16[1] | 16[1] | 16[1] | 16[1] |
| Av. age (fall 1956) | 14½ mos. | 20½ mos. | 14½ mos. | 20½ mos. |
| Av. wt. (fall 1956) | 726 | 845 | 701 | 803 |
| Days on pasture | 185 | 185 | 144 | 144 |
| Av. gain on pasture | 1.25 | 1.71 | 1.00 | 1.56 |
| Days on feed | 50 | 50 | 83 | 83 |
| Av. gain on feed | 2.29 | 2.60 | 2.15 | 2.42 |
| Animals slaughtered: | | | | |
| Av. age at slaughter | 16 mos. | 22 mos. | 16 mos. | 22 mos. |
| Av. slaughter weight | 839 | 975 | 881 | 1008 |
| Av. slaughter grade | 10.2 | 10.4 | 10.8 | 10.7 |
| Av. dressing perdent | 54.87 | 55.37 | 56.72 | 57.66 |
| Av. carcass grade | 10.6 | 10.9 | 9.8 | 10.6 |

[1] Eight of each 16 were fed grain at rate of 1% of body weight while on pasture.

Feedlot ration per head daily:

| | | | |
|---|---|---|---|
| Hay | 5 lbs. | 41% cottonseed meal | )Angus |
| Corn silage | 16.5 lbs. | 1.2 lbs. | ) and |
| Corn | 12.3 | | )Hereford |

1957 Daily Feed Ration

| | | |
|---|---|---|
| Herefords: | Ground shelled corn | 12.2 lbs. per head |
| | 41% cottonseed meal | 1.0 lbs. per head |
| | Alfalfa-orch-hay | 12.5 lbs. per head |
| Angus: | Ground shelled corn | 11.9 lbs. per head |
| | 41% cottonseed meal | 1.0 lbs. per head |
| | Alfalfa-orch-hay | 10.3 lbs. per head |

I. Project Title:

The Improvement of Beef Cattle for Virginia Through Breeding Methods.

II. Objectives:

Beef cattle projects are conducted with three breeds of cattle. Angus, Hereford, and Shorthorns and are associated with problems relating to the improvement of beef cattle for Virginia through breeding methods.

The objectives of the investigation are as follows:

1. To establish, maintain, and develop herds of beef cattle within the purebreeds that will be highly adapted to the Appalachian region, as measured by their ability to utilize grass and rations with limited concentrates, in the efficient production of animals which yield high quality carcasses of desirable type and conformation.

2. To estimate the progress to be expected from mass selection as compared with family selection in the improvement of beef cattle.

3. To evaluate selection criteria and procedures, and develop more precise and effective measures of quality and performance of beef cattle.

4. To simplify methods of progeny or sib testing whereby breeding cattle can be evaluated at comparatively young ages.

The general plan is to develop herds of beef cattle that will be capable of producing offspring that will make rapid and efficient gains, produce a high-quality carcass, and possess a desirable type and high fertility in the case of breeding cattle.

The herds are being established on a broad scope so that the direction or emphasis of future research can be revised or adapted to future needs without retarding the program. The breeding cows now in the research herds represent samples from several lines within each of three breeds. Cattle of similar genetic background (of the same bloodlines) within each breed have been divided into herds, some of which will be maintained as closed or inbred lines and others as out-bred herds.

III. Accomplishments During the Year:

(a) Facilities and cattle acquired:

The facilities for handling and doing research with beef cattle at this station, consist of approximately 4161 acres of land. Topography would be classed steep and rough. Soil type as classified by soils men as "Green-stone". Soil origin from a granite sandstone. It is a good pasture soil and very productive under proper fertilization and management. There are approximately 2600 acres of pasture or open land with a carrying capacity of approximately one animal unit per four acres, during a normal season. Potential carrying capacity is much higher with heavy fertilization, normal

rain fall, and proper land use. Land suitable for cultivation is very limited. To supplement station land for cultivation there is a 130 acre river bottom farm rented for that purpose.

Approximately 2561 acres of wood land, that furnishes lumber and post for construction and fencing.

The services of an experimental cold-process pellet machine was acquired in fall of 1957 and the station will have the use of it for one year.

A Daffin one package batch grinding and mixing feed plant was installed in January 1957.

The cattle holding pens and working chute at the Marvin Maddox area were remodeled and improved.

A 5000# capacity floor level, Fairbanks scale was remodeled and installed at the Green Mill steer feeding unit.

Holding lots were constructed at the cattle pavillion, to display cattle during field day.

Cattle:

Two young Angus bulls were purchased and added to the 1957-58 R.O.P. feeding groups. Forty (40) young bulls dropped at this station were put on R.O.P. October 1957 (16 Angus, 10 Hereford, and 14 Shorthorn).

The 1957 breeding herds were increased by production of 115 head. The increase included 37 Angus, 32 Hereford, and 46 Shorthorn. 142 head of female calves were put on R.O.P. group feeding test in 1957 (56 Angus, 39 Hereford, and 47 Shorthorn).

b. Research Results:

Breeding dates were obtained on cows in all the breeding herds by Dr. J. N. Wiltbank and station personnel using the same method and procedures as in 1956. Rectal palpation of all cows for pregnancy was done at the breeding season in late June, in August, and mid-September. Results of these observations indicated that of the 486 total cows in the 1957 breeding herds, 410 cows were pregnant on either the late June or August check. Of the 410 which were dianosed pregnant in August, 405 were still pregnant in the mid-September check, indicating that early embryonic death losses for this group of cows was quite small.

Post Weaning Performance Tests:

Performance tests of the high index bull calves in each sire group was continued with 42 head individually fed for a period of 168 days. R.O.P. bulls not needed in the breeding program and were considered good enough to comply with sale standards were offered for sale at auction. The minumum standard for bulls to be offered for sale was the equivalent of 2# gain per day and a type score of 11 (good+). Performance information was furnished on each bull at the

time of sale and on the average higher prices were paid for the faster gaining bulls.

Performance tests of all heifer calves weaned (with clear pedigrees) continued with 142 head being tested in three groups for rate of gain in the wintering feeding period of 140 days with wet apple pomace feed free choice and a hay-grain-ration held constant at 6# calves were grouped according to weight. Across breeds and given access to pasture space of approximately ½ acre per head. Performance test of steer progeny was initiated in 1956-57 to make a comparison of three different preparations of the same feed ration.

Title: Comparison of Ground, Pelleted and Long Hay Ration for Beef Steers.

Ration

| | |
|---|---|
| Corn and cob meal | 1200# |
| Linseed Oil meal | 100# |
| Cottonseed meal | 100# |
| Ground Alfalfa Hay | 300# |
| Ground Orchard Grass | 300# |

A total of 60 steers from 10 different sires were used. Steers were random replicated by sires and by feed treatments.

Group I The ration for Group I was ground, mixed, and fed 196 days.

Group II Received the same ration but in pellets and fed 196 days.

Group III Was fed long hay free choice and the grain restricted so that the ratio of grain to hay was the same as in Groups I and II. Less hay was consumed and consequently received less grain and less total feed than Group I and II.

IV. Future Plans:

The long range program of forming inbred lines and selection herds from common sources will be continued. Proportionally more effort will be put into evaluation of existing lines and crosses within breeds.

If conditions permit, a program of testing wintering rations on yearling heifers will be initiated under the supervision of Dr. J. P. Fontenot of the Animal Husbandry Department at Blacksburg. The ration to be compared would be expected to show small differences, yet by the strength of numbers contribute reliable information on economical ration formulation. If possible, extreme ration differences which might invalidate subsequent genetic information will be avoided. Comparisons of group-fed vs. individually-fed bulls are being considered. Increased interest in performance testing suggests that more information is needed on the relative costs, labor efficiency, and the amount of genetic information obtained under the two systems.

Analysis of existing data is planned through the use of IBM methods and IBM facilities at Blacksburg, Virginia (V.P.I.) and at Beltsville, Maryland (U.S.D.A.) will be used. Some of the methods of recording in the field are being modified so that the raw data may be punched directly on IBM cards. Many of the current records will be kept on McBee Keysort cards beginning next year. These cards will contain primarily individual identification information (e.g., tattoo, sex, breed, line, tattoos of sire and dam, etc.) and should improve the accuracy and speed with which field work lists can be prepared and/or checked.

PERFORMANCE OF COW HERDS. 1957 CALVES

Front Royal Virginia Station

| Line of group designation | 057 | 059 &870 | 145 | 145 | 420 | 420 | 890 | 890 | 1081 | 1093 | 1133 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | FRONT ROYAL | | | | | | | | | | |
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Here. | Angus | Here. | Angus | Here. | Angus | Angus | Angus |
| No. cows bred | 14 | 16 | 24 | 2 | 24 | 2 | 30 | 9 | 16 | 16 | 15 |
| No. cows calving | 14 | 8 | 19 | 2 | 20 | 2 | 25 | 8 | 15 | 15 | 14 |
| No. calves raised | 11 | 6 | 19 | 2 | 19 | 2 | 24 | 7 | 12 | 13 | 14 |
| Av. birth date | 2/5/57 | 3/11/57 | 2/13/57 | 3/4/57 | 2/8/57 | 2/28/57 | 2/7/57 | 3/13/57 | 2/12/57 | 2/2/57 | 2/4/57 |
| Av. birth wt. (lbs) | 63--4 | 70--2 | 66--11 | 74--1 | 72--10 | 77--1 | 74--10 | 62--4 | 66--4 | 75--6 | 64--7 |
| Bulls | 63--4 | 70--2 | 66--11 | 74--1 | 72--10 | 77--1 | 74--10 | 62--4 | 66--4 | 75--6 | 64--7 |
| Heifers | 60--7 | 62--2 | 63--7 | 68--1 | 63--9 | 68--1 | 67--13 | 63--3 | 62--7 | 64--5 | 61--7 |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | |
| Bulls | 334--3 | 440--2 | 407--8 | 441--1 | 452--9 | 448--1 | 459--8 | 320--4 | 392--3 | 433--6 | 392-5 |
| Steers | 320--1 | -- | 343--3 | -- | 369--1 | -- | 321--2 | -- | -- | -- | 334-2 |
| Heifers | 313--7 | 323--2 | 329--6 | 374--1 | 349--8 | 414--1 | 391--13 | 328--3 | 367--7 | 353--5 | 371-7 |
| Av. weaning date: | | | | | | | | | | | |
| Bulls) | | | | | | | | | | | |
| Steers) | 11/6/57 | | | | | | | | | | |
| Heifers) | | | | | | | | | | | |
| Av. weaning wt. | | | | | | | | | | | |
| Bulls | 495 | 570 | 573 | 583 | 649 | 600 | 658 | 420 | 556 | 634 | 572 |
| Steers | 458 | - | 485 | - | 532 | - | 453 | - | - | - | 471 |
| Heifers | 463 | 412 | 457 | 493 | 496 | 556 | 562 | 431 | 518 | 518 | 536 |
| Av. weaning type score | | | | | | | | | | | |
| Bulls | 10.0-3 | 11.9-2 | 12.3-8 | 12.0-1 | 10.8-9 | 10.6-1 | 10.9-8 | 9.0-4 | 11.0-4 | 12.1-6 | 10.6-5 |
| Steers | 9.2-1 | - | 11.1-3 | - | 11.2-1 | - | 8.1-2 | - | - | - | 8.3-2 |
| Heifers | 10.3-7 | 10.8-2 | 12.1-7 | 12.8-1 | 11.2-9 | 13.2-1 | 10.9-13 | 9.3-3 | 13.3-7 | 11.2-5 | 11.5-7 |

PERFORMANCE OF COW HERDS. 1957 CALVES

Front Royal, Virginia Station

| Line of group designation | 1118 | 86 | 114 | 114 | 114 | 287 | 287 | 885 | 1119 | 1174 | 1176 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | FRONT ROYAL | | | | | | |
| Breed of sire | Sh | Sh | Sh | Sh | Sh | Sh | Sh | Sh | Sh | Sh | Sh |
| Breed of dam | Here. | Sh. | Sh. | Angus | Here. | Sh. | Here. | Sh. | Sh | Sh. | Sh. |
| No. cows bred | 3 | 14 | 30 | 3 | 1 | 43 | 3 | 16 | 22 | 22 | 16 |
| No. cows calving | 2 | 9 | 24 | 3 | 1 | 28 | 3 | 14 | 15 | 15 | 13 |
| No. calves raised | 2 | 8 | 15 | 3 | 1 | 26 | 3 | 10 | 14 | 12 | 11 |
| Av. birth date | 3/12/57 | 2/10/57 | 2/15/57 | 2/10/57 | 1/25/57 | 2/3/57 | 2/19/57 | 2/9/57 | 2/15/57 | 2/19/57 | 2/20 |
| Av. birth wt. (lbs) | | | | | | | | | | | |
| Bulls | - | 73-3 | 74-9 | 69-3 | -- | 72-11 | 75-1 | 76-6 | 73-7 | 75-6 | 74-5 |
| Heifers | 65-2 | 67-5 | 65-6 | -- | 75-1 | 68-14 | 62-2 | 72-4 | 71-7 | 70-6 | 67-6 |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | |
| Bulls | | 388-3 | 367-8 | 385-3 | | 362-8 | 383-1 | 371-5 | 382-6 | 436-5 | 360-4 |
| Steers | | | 328-1 | | | 286-3 | | 293-1 | 301-1 | 369-1 | 324-1 |
| Heifers | 374-2 | 327-5 | 347-6 | | 385-1 | 332-14 | 351-2 | 345-4 | 360-7 | 343-6 | 325-6 |
| Av. weaning date | 11/6/57 | | | | | | | | | | |
| Av. weaning wt: | | | | | | | | | | | |
| Bulls | | 548 | 503 | 550 | | 519 | 520 | 520 | 531 | 604 | 490 |
| Steers | | | 446 | | | 405 | | 409 | 416 | 506 | 439 |
| Heifers | 480 | 459 | 481 | | 573 | 476 | 482 | 486 | 499 | 473 | 443 |
| Av. weaning type score: | | | | | | | | | | | |
| Bulls | | 11.3-3 | 10.5-8 | 8.8-3 | | 10.8-8 | 10.8-1 | 8.9-5 | 11.0-6 | 11.0-5 | 10.4-4 |
| Steers | | | 9.8-1 | | | 8.5-3 | | 9.8-1 | 11.2-1 | 11.0-1 | 9.6-1 |
| Heifers | 11.4-2 | 10.8-5 | 11.2-6 | | 12.2-1 | 12.2-14 | 13.6-2 | 8.9-4 | 11.3-7 | 10.4-6 | 9.9-6 |
| Calves slaughtered at weaning: | NONE | | | | | | | | | | |

PERFORMANCE OF CATTLE HERDS. 1957 CALVES

Front Royal, Virginia Station

| Line of group designation | 026 | 153 | 322 | 373 | 417 | 417 | 863 | 863 | 863 | 1118 | 1118 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | | | FRONT ROYAL | | | | | | |
| Breed of sire | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Here. | Sh. | Sh. |
| Breed of dam | Here. | Here. | Here. | Here. | Here. | Angus | Here. | Sh. | Angus | Sh. | Angus |
| No. cows bred | 26 | 14 | 25 | 21 | 14 | 1 | 23 | 2 | 2 | 10 | 4 |
| No. cows calving | 19 | 11 | 23 | 19 | 10 | 1 | 17 | 2 | 2 | 8 | 3 |
| No. calves raised | 17 | 10 | 23 | 18 | 10 | 1 | 15 | 1 | 1 | 4 | 2 |
| Av. birth date | 2/15/57 | 3/12/57 | 2/11/57 | 2/12/57 | 2/20/57 | 2/14/57 | 2/23/57 | 2/5/57 | 3/12/57 | 2/5/57 | 3/12/57 |
| Av. birth wt. (lbs) | | | | | | | | | | | |
| Bulls | 77--8 | 76--3 | 73--13 | 75--13 | 73--4 | - | 69--8 | 68--1 | -- | 62--2 | 66-2 |
| Heifers | 73--9 | 66--7 | 72--10 | 71--5 | 67--6 | 60--1 | 71--7 | -- | 86--1 | 59--2 | -- |
| Av. wt. at 6 mos. (lbs) | | | | | | | | | | | |
| Bulls | 374-6 | 402-2 | 403-10 | 377-10 | 404-2 | -- | 351-7 | 349-1 | -- | 386-1 | 458-2 |
| Steers | 358-2 | 417-1 | 323-3 | 323-3 | 353-1 | -- | 360-1 | -- | -- | 244-1 | -- |
| Heifers | 338-9 | 357-7 | 339-10 | 342-5 | 343-6 | 337-1 | 319-7 | -- | 370-1 | 364-2 | -- |
| Av. weaning date: | | | | | | | | | | | |
| Bulls ) | | | | | | | | | | | |
| Steers ) | 11/6/57 | | | | | | | | | | |
| Heifers ) | | | | | | | | | | | |
| Av. weaning wt. | | | | | | | | | | | |
| Bulls | 513 | 515 | 568 | 527 | 553 | - | 479 | 496 | -- | 569 | 547 |
| Steers | 487 | 526 | 457 | 452 | 491 | - | 479 | - | -- | 347 | -- |
| Heifers | 464 | 456 | 475 | 479 | 468 | 481 | 428 | - | 473 | 532 | -- |
| Av. weaning type score: | | | | | | | | | | | |
| Bulls | 10.6-6 | 10.3-2 | 10.9-10 | 10.0-10 | 9.9-3 | -- | 9.9-6 | 10.8-1 | -- | 11.4-1 | 10.3-2 |
| Steers | 10.2-2 | 12.6-1 | 10.7-3 | 10.3-3 | 11.2-1 | -- | 9.0-1 | -- | -- | 8.6-1 | -- |
| Heifers | 11.2-9 | 11.4-7 | 10.9-10 | 9.9-5 | 9.9-6 | 10.0-1 | 10.1-7 | -- | 9.6-1 | 12.4-2 | -- |

POST-WEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING (OR PASTURED FOR HIGH GAINS)

Front Royal, Virginia Station

| Breed of calves | Angus | Here. | Here. | Here. | Here. | Here. | Shorthorn | 82 Here | 890 Angus | 1046 Angus | 59 Angus |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulls, No. | 2 | 1 | 1 | 2 | 1 | 2 | 2 | | 5 | 1 | 1 |
| Av. inbreeding | | | | | | | | | | | |
| Av. weaning wt. | 542 | 447 | 412 | 584 | 431 | 448 | 481 | | 525 | 487 | 594 |
| Av. final wt. | 944 | 779 | 726 | 995 | 804 | 823 | 917 | | 884 | 881 | 1010 |
| Length feeding period | 168 | 168 | 168 | 168 | 168 | 168 | 168 | | 168 | 168 | 168 |
| Feed per cwt. gain (lbs) | | | | | | | | | | | |
| Av. daily gain on test | 2.39 | 2.06 | 1.95 | 2.67 | 2.42 | 2.43 | 2.71 | | 2.14 | 2.35 | 2.48 |
| Av. type score (12 mos.) | 11.6 | 10.3 | 11.6 | 10.7 | 12.8 | 9.8 | 11.3 | | 11.5 | 10.4 | 10.4 |
| Steers, No. | | | | | | | | 7 | 6 | | |
| Av. weaning wt. | | | | | | | | 482 | 553 | | |
| Av. final wt. | | | | | | | | 878 | 955 | | |
| Length feeding period | | | | | | | | 196 | 196 | | |
| Av. daily gain on test | | | | | | | | 1.93 | 2.02 | | |
| Av. type score (12 mos.) | | | | | | | | 10.8 | 12.7 | | |
| Heifers, No. | | | | | | | | | 15 | 4 | 2 |
| Av. weaning wt. | | | | | | | | | 497 | 508 | 513 |
| Av. final wt. | | | | | | | | | 667 | 664 | 716 |
| Length feeding period | | | | | | | | | 126 | 126 | 126 |
| Av. daily gain on test | | | | | | | | | 1.35 | 1.24 | 1.61 |
| Av. type score (12 mos) | | | | | | | | | 11.6 | 11.6 | 12.3 |

Heifers, Summer Gain: 3/19-8/13/57 (147 days) .90 .92 1.04

Buxom Esquire

JHR Capital Domino

Capitan Domino 37

Court Linoheart

CK Crusty-sixty 18th

EPF Jupiter Domino 54th

Willow Lee Wonder 24th

S. Hillcrest Dom. 5th

Blackwood Bandy of FR 4

Sir Eileenmere of FR 4

KB Eileenmere 21

POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Front Royal, Virginia Station

| | 870 | 420 | 150 | R26 | 1444 | 373 | 52 | Purchased heifers) | 114 | 1049 |
|---|---|---|---|---|---|---|---|---|---|---|
| Breed of calves | Angus | Angus | Angus | Here | Here | Here | Here | Here | Short. | Short. |
| Bulls, No. | 1 | 3 | 3 | 1 | 3 | 3 | | | 3 | 2 |
| Av. weaning wt. | 504 | 571 | 568 | 600 | 561 | 585 | | | 562 | 500 |
| Av. final wt. | 930 | 986 | 925 | 1006 | 975 | 980 | | | 964 | 904 |
| Length feeding period | 168 | 168 | 168 | 168 | 168 | 168 | | | 168 | 168 |
| Av. daily gain on test | 2.54 | 2.47 | 2.13 | 2.42 | 2.46 | 2.35 | | | 2.39 | 2.40 |
| Av. type score (12 mos.) | 9.8 | 10.9 | 11.3 | 11.4 | 9.8 | 10.9 | | | 11.9 | 12.2 |
| Steers, No. | | 5 | 3 | 6 | 6 | | | | 5 | |
| Av. weaning wt. | | 556 | 532 | 443 | 522 | | | | 471 | |
| Av. final wt. | | 933 | 907 | 824 | 930 | | | | 862 | |
| Length feeding period | | 196 | 196 | 196 | 196 | | | | 196 | |
| Av. daily gain on test | | 1.92 | 1.9 | 1.94 | 2.08 | | | | 2.00 | |
| Av. type score (12 mos.) | | 11.8 | 12.0 | 9.7 | 10.8 | | | | 11.2 | |
| Heifers, No. | 2 | 16 | 7 | 12 | 5 | 5 | 1 | 24 | 10 | 8 |
| Av. wt. on test 11/13/56 | 561 | 499 | 482 | 419 | 484 | 504 | 462 | 378 | 475 | 432 |
| Av. final wt. 3/19/57 | 724 | 665 | 648 | 579 | 668 | 699 | 662 | 537 | 624 | 592 |
| Length feeding period | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |
| Av. daily gain on test | 1.30 | 1.31 | 1.32 | 1.27 | 1.46 | 1.54 | 1.59 | 1.26 | 1.19 | 1.27 |
| Av. type score (12 mos.) | 10.6 | 11.9 | 11.8 | 10.4 | 10.9 | 12.3 | 11.9 | 11.3 | 11.4 | 12.2 |
| Heifers, Summer Gain: 3/19-8/13/57 (147 days) | 1.20 | .96 | .89 | .87 | .85 | .71 | .90 | .87 | .73 | .66 |

870 Eileenmere of FR 5
420 Blackcap Stamp of Elkton 2
150 Cornwell Bandolier 150
R26 Capitan Domino 25
1444 LI Domino 116
373 Coastal Beau Rollo 9
52 CMF Royal Domino 27
Purchased heifers) (Bought Heifers)
114 Prince Eric
1049 T. Prince Command of FR 3

# POSTWEANING PERFORMANCE OF 1956 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Front Royal, Virginia Station

| | 885 | T44 | B287 | 663 | 1060 |
|---|---|---|---|---|---|
| Breed of Calves | Short. | Short. | Short. | | |
| Bulls, No. | 2 | 1 | 2 | | 2 |
| Av. weaning wt. | 555 | 478 | 490 | | 500 |
| Av. final wt. | 972 | 898 | 865 | | 884 |
| Length feeding period | 168 | 168 | 168 | | 168 |
| Av. daily gain on test | 2.48 | 2.50 | 2.23 | | 2.29 |
| Av. type score (12 mos.) | 11.4 | 10.8 | 12.4 | | 10.2 |
| Steers, No. | 3 | | 7 | | 6 |
| Av. weaning wt. | 487 | | 520 | | 410 |
| Av. final wt. | 905 | | 914 | | 826 |
| Length feeding period | 196 | | 196 | | 196 |
| Av. daily gain on test | 2.13 | | 2.01 | | 2.12 |
| Av. type score (12 mos.) | 10.7 | | 12.7 | | 11.2 |
| Heifers, No. | 5 | 1 | 13 | 5 | 5 |
| Av. wt. on test 11/13/56 | 497 | 366 | 485 | 470 | 495 |
| Av. final wt. 3/19/57 | 673 | 415 | 636 | 623 | 668 |
| Length feeding period | 126 | 126 | 126 | 126 | 126 |
| Av. daily gain on test | 1.40 | .39 | 1.20 | 1.21 | 1.38 |
| Av. type score (12 mos.) | 10.6 | 6.1 | 12.4 | 10.5 | 10.8 |
| Heifers, Summer Gain: (3/19-8/13/57 - 147 days) | .66 | .75 | .58 | .70 | .80 |
| | C. Statesman of FR 4 | Grassdale Leader | Britomac Prince Command | Baron Kinsman | Grassdale Leader of FR 25th |

# S-10, IMPROVEMENT OF BEEF CATTLE FOR THE SOUTHERN REGION THROUGH BREEDING METHODS

- REPORT OF-

ANNUAL MEETING S-10 TECHNICAL COMMITTEE

HELD AT

THE UNIVERSITY OF ARKANSAS
FAYETTEVILLE, ARKANSAS

July 20 - 23, 1958



State Experiment Stations of Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia and West Virginia in cooperation with the Animal Husbandry Research Division, Agricultural Research Service, United States Department of Agriculture. This report is intended for the use of administrative leaders and workers in developing the program and is not for general distribution.

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TABLE OF CONTENTS
S-10 TECHNICAL COMMITTEE MEETING
July 20 - 23, 1958


| | Page |
|---|---|
| Program . . . . . | 1 |
| Highlights of the Meeting and Personnel Attendin . . . . . | 3 |
| Minutes of the Executive Committee Meeting . . . . . | 5 |
| Minutes of the Business Meeting . . . . . | 5 |
| Allocation of Funds . . . . . | 11 |
| Cattle Inventory - July 1, 1958 . . . . . | 12 |
| Summary of Data Related to Efficiency of Milk Utilization . . . . . C. J. Brown | 13 |
| Summary of Individual Feeding Trials of Bulls . . . . . C. J. Brown | 16 |
| Summary of Digestive Studies on Individually Fed Yearling Bulls . . . C. J. Brown and Maurice L. Ray | 24 |
| Utilization of Feed by Beef Calves From 90 to 370 Days of Age.. . . . W. W. Green | 35 |
| The Influence of Shifting Consumer Demand on Selection Programs and Current Research in Animal Breeding . . N. R. Gyles | 37 |
| Gain and Efficiency of Beef Calves on Different Levels of Feeding . . . . .H. J. Smith and C. S. Hobbs | 39 |
| Heritability of Feed Efficiency in Beef Cattle That Are Full Fed . . . . . J. A. Gaines and R. C. Carter | 43 |
| The Influence of Body Weight on Feed Intake, Daily Gain and Efficiency . . . . C. M. Kincaid and E. H. Vernon | 47 |
| Efficiency of Feed Utilization for Growth and Fattening of Beef Cattle . . . . Keith Gregory | 53 |
| A Review of Studies Conducted in W-1 on Efficiency of Feed Utilization in Beef Cattle . . . C. E. Shelby | 92 |
| Summary and Discussion on Measurement of Efficiency in Beef Cattle . . . . . E. J. Warwick | 56 |
| National Status of Performance Testing for Beef Cattle as Part of the Extension Service Program . . . . C. E. Bell | 59 |
| State Reports: | |
| Alabama . . . . . | 61 |
| Arkansas . . . . . | 28 |
| Florida . . . . . | 63 |
| Georgia . . . . . | 73 |
| Louisiana . . . . . | 76 |
| Mississippi . . . . . | 83 |
| North Carolina . . . . . | 89 |

PROGRAM

1958 S-10 TECHNICAL COMMITTEE MEETING
University of Arkansas, Fayetteville, Arkansas
July 20-23, 1958

Sunday, July 20, 1958

6:00 p.m. Picnic Supper. Barton's Pavilion, University Farm.

7:30 p.m. Executive Committee Meeting.

Monday, July 21, 1958

Animal Science Building.
Dr. Warren Gifford, Chairman, Technical Committee, presiding.

8:15 a.m. .. Call to order. Roll call. Introductions. Committee appointments.
8:25 a.m. .. A brief look at Arkansas Agricultural Experiment Station. Dr. J. W. White, Associate Director, University of Arkansas,
9:00 a.m. .. Summary of Data Related to Efficiency of Milk Utilization by Beef Calves. C. J. Brown, Arkansas
9:30 a.m. .. Utilization of Feed by Beef Calves from 90 to 370 Days of Age. W. W. Green. Maryland.
10:10 a.m. .. Recess.
10:20 a.m. .. (a) Summary of Individual Feeding Trials of Bulls. C. J. Brown. Arkansas
(b) Summary of Digestive Studies on Individually Fed Yearling Bulls. C. J. Brown and Maurice L. Ray. Ark.
11:30 a.m. .. Arkansas Station progress report and preview of what will be seen on afternoon tour.
12:00 noon .. Lunch
1:00 p.m. .. Tour of Arkansas Research Facilities.
6:30 p.m. .. Dinner meeting. "The Influence of Shifting Consumer Demand on Selection Programs and Current Research in Animal Breeding". Dr. R. Gyles. Arkansas.

Tuesday, July 22, 1958

8:00 a.m. .. Gain and Efficiency of Beef Calves on Different Levels of Feeding. H. J. Smith, C. S. Hobbs.
8:40 a.m. .. Heritability of Feed Efficiency in Beef Cattle that Are Full Fed. J. A. Gaines and R. C. Carter.
9:50 a.m. .. Recess
10:00 a.m. .. The Influence of Body Weight on Feed Intake, Daily Gain and Efficiency. C. M. Kincaid and E. H. Vernon.
10:30 a.m. .. Efficiency of Feed Utilization for Growth and Fattening of Beef Cattle. Keith Gregory.
11:00 a.m. .. Review of studies on efficiency in W-1 project. C. B. Shelby.
11:30 a.m. .. Summary and Discussion on Measurement of Efficiency in Beef Cattle. E. J. Warwick
12:00 noon .. Lunch.

Tuesday, July 22, 1958

1:10 p.m. .. National Status of Performance Testing for Beef Cattle as Part of the Extension Service Program.
C. E. Bell, Extension Animal Husbandman

Station Progress Reports:

2:10 p.m. .. Alabama
2:40 p.m. .. Recess
2:50 p.m. .. Florida
3:20 p.m .. Georgia
3:50 p.m. .. Louisiana
4:20 p.m. .. Adjourn.

7:30 p.m. .. Committee Meetings.

Wednesday, July 23, 1958

Station Progress Reports continued.

8:00 a.m. .. Mississippi
8:30 a.m. .. North Carolina
9:00 a.m. .. Further discussion of State Reports.
9:30 a.m. .. Review of S-10 contributing projects and discussion of the regional project outline and reporting procedures.
10:10 a.m. .. Recess
10:20 a.m. .. Business meeting.
12:00 noon .. Adjourn.

# 1958 S-10 TECHNICAL COMMITTEE MEETING

The 1958 meeting of the S-10 Technical Committee was held at the University of Arkansas, Fayetteville, Arkansas, July 21-23, 1958. Members of the committee were guests of the Department of Animal Industry at a picnic supper the evening of July 20, 1958. Later that evening, a meeting of the Executive Committee was convened.

The S-10 Technical Committee Meeting was called to order by Dr. Warren Gifford, Chairman, at 9:15 a.m. July 21, 1958. Dr. Gifford presented Dr. J. W. White, Associate Director of the Arkansas Agricultural Experiment Station who extended a cordial welcome to the committee and also made a few remarks about the Arkansas station.

Each person was asked to introduce himself. The following members of the Technical Committee and guests were present: (Technical Committee members designated by *, acting by **)

*T. B. Patterson, Ala. Agr. Exp. Sta., Auburn, Ala.
W. M. Warren, Ala. Agr. Exp. Sta., Auburn, Ala.
*Warren Gifford, Ark. Agr. Exp. Sta., Fayetteville, Ark.
J. W. White, Ark. Agr. Exp. Sta., Fayetteville, Ark.
C. B. Brown, Ark. Agr. Exp. Sta., Fayetteville, Ark.
M. L. Ray, Ark. Agr. Exp. Sta., Fayetteville, Ark.
Elmer Kraibiel, Ark. Agr. Exp. Sta., Fayetteville, Ark.
Paul R. Noland, Ark. Agr. Exp. Sta., Fayetteville, Ark.
Calvin Drake, Ark. Agr. Exp. Sta., Fayetteville, Ark.
R. B. Hallmark, Ark. Agr. Ext. Ser., Fayetteville, Ark.
*Marvin Koger, Fla. Agr. Exp. Sta., Gainesville, Fla.
*B. L. Southwell, Ga. Coastal Plain Exp. Sta., Tifton, Ga.
W. C. McCormick, Ga. Coastal Plain Exp. Sta., Tifton, Ga.
T. M. Clyburn, Ga. Agr. Exp. Sta., Reidsville, Ga.
*R. L. Lamon, Jr., La. Agr. Exp. Sta., Baton Rouge, La.
*W. W. Green, Md. Agr. Exp. Sta., College Park, Md.
**Bryan Baker, Miss. Agr. Exp. Sta., State College, Miss.
J. C. Taylor, Miss. Agr. Exp. Sta., State College, Miss.
*J. H. Gregory, N. C. Agr. Exp. Sta., Raleigh, N. C.
H. A. Stewart, N. C. Agr. Exp. Sta., Raleigh, N. C.
E. R. Barrick, N. C. Agr. Exp. Sta., Raleigh, N. C.
*E. G. Godbey, S. C. Agr. Exp. Sta., Clemson, S. C.
W. C. Godley, S.C. Agr. Exp. Sta., Clemson, S. C.
*C. S. Hobbs, Tenn. Agr. Exp. Sta., Knoxville, Tenn.
*T. C. Cartwright, Tex. Agr. Exp. Sta., McGregor, Tex.
**J. A. Gaines, Va. Agr. Exp. Sta., Blacksburg, Va.
K. P. Bovard, Va. Agr. Exp. Sta., Front Royal, Va.
N. M. Kieffer, Okla. Agr. Exp. Sta., Stillwater, Okla.
J. C. Glenn, Okla. Agr. Exp. Sta., Stillwater, Oklahoma
C. M. Kincaid, Regional Coordinator, AHRD, USDA, Knoxville, Tennessee
M. J. Burris, SESD, USDA, Washington, D. C.
E. J. Warwick, AHRD, USDA, Beltsville, Md.
K. E. Gregory, ARS, USDA, Lincoln, Nebraska
C. E. Shelby, ARS, USDA, Denver, Colo.
C. E. Bell, Jr., Agri. Ext. Ser., USDA, Washington, D. C.
W. C. Burns, AHRD, USDA, West Central Fla. Exp. Sta., Brooksville, Florida
B. M. Priode, AHRD, USDA, Beef Cattle Research Sta., Front Royal, Virginia

Dr. Gifford then made a few announcements and appointed three committees, the reports of which will be presented in connection with the minutes of the business meeting. The rest of the morning was devoted to papers concerning the problem of the efficiency of feed utilization by cattle. All but one of the papers concerned work at Arkansas and constituted the progress report for that station. The afternoon was devoted to a tour of the research facilities used for beef cattle at the Arkansas station. A dinner meeting of the group was held and after dinner Dr. R. Gyles of the Poultry Section of the Arkansas station addressed the group on the topic "The Influence of Shifting Consumer Demand on Selection Programs and Current Research in Animal Breeding".

The morning of July 22, 1958 was devoted to the presentation of additional papers relative to the efficiency of feed utilization including reports from the coordinators of the North Central and Western Regional Beef Cattle Breeding Projects. After a talk by Mr. C. E. Bell concerning the status of performance testing for beef cattle in the United States the rest of the afternoon was devoted to progress reports from the following stations: Alabama, Florida, Georgia and Louisiana. Reports from the Mississippi and North Carolina stations were given the morning of July 23, 1958. After a general discussion of the reports a business meeting was held.

Copies of the minutes of the Executive Committee meeting, the business meeting of the S-10 Technical Committee and all papers and station reports are included and follow in this report.

MEETING OF THE EXECUTIVE COMMITTEE OF THE SOUTHERN REGIONAL BEEF CATTLE BREEDING PROJECT.

Project S-10. Fayetteville, Arkansas July 20, 1958

The Executive Committee of the Technical Committee S-10, Southern Regional Beef Cattle Breeding Project met at the Mountain Inn Hotel, Fayetteville, Arkansas, 8:30 p.m. July 20, 1958. Dr. Warren Gifford presided. The Executive Committee members present were Dr. Warren Gifford, Dr. W. W. Green, Dr. T. C. Cartwright, and Dr. C. M. Kincaid. Others present were Dr. H. A. Stewart, Dr. E. J. Warwick and Dr. M. J. Burris.

The minutes of the 1957 meeting of the Executive Committee were read and approved.

The program for the 1958 S-10 Technical Committee meeting was reviewed and discussed. Proposed regional publications were discussed. It was decided to appoint a committee composed of Dr. R. A. Damon, Jr., Dr. W. C. McCormick and Dr. W. C. Godley to review the status of the report on crossbreeding and to have the committee report at the business meeting to be held on July 23, 1958.

Dr. Kincaid brought up the matter of having annual reports prepared in conjunction with the meetings of the Technical Committee After discussion, it was decided to refer the matter to the Technical Committee.

Dr. Warwick mentioned two resolutions passed by the Technical Committees of the other two regions. It was decided that a committee composed of Dr. M. Koger, Dr. W. M. Warren, and Dr. T. C. Cartwright should be appointed to review these resolutions and to report to the S-10 business meeting.

The meeting was adjourned at 10:30 p.m.

BUSINESS MEETING OF THE TECHNICAL COMMITTEE OF THE SOUTHERN REGIONAL BEEF CATTLE BREEDING PROJECT, S-10.

Fayetteville, Arkansas
Minutes, July 23, 1958

The Technical Committee of the Southern Regional Beef Cattle Breeding Project (S-10) met in the Animal Industry building, 10:00 a.m., University of Arkansas, Fayetteville, Arkansas. The chairman, Dr. Warren Gifford, called the meeting to order and requested a roll call of the members. The following were present:

T. B. Patterson, Ala. Agr. Exp. Sta., Auburn, Ala.
Warren Gifford, Ark. Agr. Exp. Sta., Fayetteville, Ark.
Marvin Koger, Fla. Agr. Exp. Sta., Gainesville, Fla.
B. L. Southwell, Ga. Coastal Plain Exp. Sta., Tifton, Ga.
R. A. Damon, Jr., La. Agr. Exp. Sta., Baton Rouge, La.
W. W. Green, Md. Agr. Exp. Sta., College Park, Md.
Bryan Baker, Jr., Miss. Agr. Exp. Sta., State College, Miss.
J. H. Gregory, N. C. Agr. Exp. Sta., Raleigh, N. C.

E. C. Godbey, S. C. Agr. Exp. Sta., Clemson, S. C.
C. S. Hobbs, Tenn. Agr. Exp. Sta., Knoxville, Tenn.
T. C. Cartwright, Tex. Agr. Exp. Sta., McGregor, Tex.
J. A. Gaines, Va. Agr. Exp. Sta., Blacksburg, Va.
C. M. Kincaid, Regional Coordinator, USDA, Knoxville, Tenn.
M. J. Burris, USDA, Washington, D. C.
E. J. Warwick, USDA, Beltsville, Md.
J. W. White, Advisor, Ark. Agr. Exp. Sta., Fayetteville, Ark.

The Chairman stated that the purpose of the business meeting was to consider current regional problems or any business or problems concerned with research, administration or publications during the coming year.

The minutes of the meeting of the Executive Committee which was held on July 20, 1958 were read and approved.

The Chairman asked Dr. R. A. Damon, Jr. for the "Report of Committee on Regional Publications" and the report was as follows:

The appointed committee met with Dr. Kincaid, Dr. Green and Dr. Gifford to consider the subject of regional publications that has been discussed during the past several S-10 meetings. After considerable discussion, the group agreed on the following resolutions:

1) That a semi-popular publication presenting the results of crossbreeding in the S-10 region be prepared by Dr. Kincaid. This will be the only publication to be considered during the coming year.

2) That Dr. Kincaid will contact all states who have data available for this publication during this business meeting.

3) That Dr. Kincaid will visit each of the states offering data for this publication as soon as possible in order to study these data and decide on the form in which he will want the data sent to him. The workers at the various stations involved will be responsible for putting the data in the proper form due to the very limited help Dr. Kincaid has available to him.

4) That the states be requested not to call for Dr. Kincaid's aid any more than is absolutely necessary during the coming year while he is accumulating these data and preparing them for publication.

Submitted by:

W. C. Godley

W. C. McCormick

R. A. Damon, Jr.

Dr. Damon indicated that the publications relative to the motion made by Dr. W. W.Green last year had not been prepared due to many unexpected assignments in duties of the coordinator combined with the very limited amount of clerical help available to the coordinator. A motion was made by Dr. Hobbs to approve the recommendations of Dr. Damon's subcommittee and to proceed along the lines which were outlined. The motion was seconded by Dr. Patterson. Motion carried. It was decided that Dr. Kincaid would contact the various stations having data.

Two items were discussed under the topic of "Old Business". The first was by Dr. Warwick relative to the preparation of a semi-technical publication concerning the results of the work done in the three regional projects. He also pointed out the possibility of the publication of an inter-regional publication. Dr. Warwick then brought up the matter of the attempt to unify terms between and within regions. Dr. Gifford reviewed briefly the meeting of research and extension personnel along with representatives of breed associations which was held in Chicago last fall. (A report of that meeting was mailed to all Technical Committee members). Mr. C. E. Bell, Extension Service, USDA, also commented on the meeting indicating that some agreement had been reached relative to certain matters which were covered in the above mentioned report. Dr. Koger then presented the "Resolution on Uniform Procedures in Reporting Performance Testing Data" which was formulated by the committee appointed to study that problem and the resolution was as follows:

The S-10 Technical Committee endorses uniformity in recording performance data in beef cattle improvement programs and suggests that the Federal Extension Animal Husbandman and the Chief of the Beef Cattle Research Branch encourage such standardization within the powers and perogatives of their offices.

This group recommends that the following basic performance items should be recorded in standard terminology:

a) Preweaning growth rate expressed as average daily gain. Actual daily gain and age at weaning should be recorded as well as adjusted values.

b) Scores expressed by a universal and descriptive scoring system. The S-10 recommended system is suggested for use. The values shown should be clearly indicated as either feeder, slaughter, or breeding cattle scores.

It is also urged that further study be given to use of sex and age of dam correction factors and to the use of relative versus absolute performance in comparing animals.

Submitted by:

M. Koger

W. M. Warren

T. C. Cartwright

Dr. Koger moved the adoption of the resolution. It was seconded by Dr. Hobbs. The motion was carried.

The following was discussed under the item of "New Business".

Dr. Kincaid pointed out that in the past the Annual Reports have been prepared on the basis of the fiscal year ending December 15. He indicated that other regions followed the practice of having the Annaul Report later and publishing it along with the material of the meeting of the Technical Committee. After some discussion Dr. Hobbs moved that the Annual Report be on a calendar year basis to agree with the OES report. The motion was seconded by Mr. Southwell. The motion was carried.

There was a general discussion of the possibility of combining data data obtained with individual feeding trials at several different stations in the region into one analysis. Dr. J. A. Gaines pointed out that the Virginia station had done a multivariate analysis of their data from individual feeding records and indicated he would be willing to process similar data from other stations. A motion was made by Dr. Hobbs that a committee be appointed to work on this and, if advisable, work with the other two regions to combine material from all three regional programs into one study. The motion was recorded and passed. Dr. Gifford indicated that he would leave appointment of this committee to the next chairman of the Technical Committee.

The theme "Meat Quality" was suggested for the next annual meeting. General acceptance of this theme was indicated but no specific motion was made.

Dr. Warwick reviewed briefly some of the work being done in the other regions as well as the southern region. He discussed a resolution passed by the W-1 relative to the registration of animals resulting from the use of artifical insemination. Dr. Warwick read the resolution adopted by the W-1 Technical Committee which was as follows:

Purebred beef cattle registry associations do not register calves produced by artificial insemination unless the breeder has at least one-fourth ownership in the sire. They do not register calves produced by artificial insemination using semen of deceased sires. The usefulness of germ plasma for experimental research is often restricted by these rules BE IT RESOLVED, THEREFORE, THAT THE W-1 TECHNICAL COMMITTEE REQUEST THE BREED ASSOCIATION TO RELAX THESE RESTRICTIONS IN THE CASE OF CALVES PRODUCED IN RESEARCH HERDS, maintained as part of the cooperative research program of the Beef Cattle Research Branch of the U. S. Department of Agriculture and State Experiment Stations.

Submitted by,

E. J. Warwick

Dr. Koger moved that the S-10 Technical Committee concur in the resolution presented by Dr. Warwick. The motion was seconded by Dr. Hobbs. The motion was carried.

Dr. Burris indicated that his office had compiled another summary or list of Federal Grant projects in the area. He also indicated that a meeting had been held at Purdue University in June relative to the formulation of a regional project on population genetics.

Dr Kincaid mentioned that discussions had been made relative to the establishment of a semen bank somewhere in the country for the storage of semen and suggested that the Technical Committee give some consideration to the matter. The Technical Committee decided not to take any action on the matter but suggested that Dr. Warwick keep the committee advised on developments relative to semen storage banks.

The report of the resolutions committee given by Mr. Southwell was as follows:

We, the S-10 Technical Committee, wish to extend our thanks and appreciation to Associate Director John W. White and to Dr. Warren Gifford and his entire staff for making this, our tenth annual meeting, one of the most pleasant and profitable we have had. The facilities were excellent. We especially want to express our appreciation for the refreshments served at various times during the meeting and also for the wonderful Arkansas hospitality displayed during the entire meeting. We ask that a copy of this expression be sent to Dr. White and to Dean L. S. Ellis.

Professor E. G. Godbey of South Carolina announces that he will retire from Clemson on January 1, 1959 and hence from their Technical Committee. Therefore, we the S-10 Committee, wish to thank Professor Godbey for the help and inspiration he has given the workers in S-10 in developing an outstanding regional project. The Committee is not unmindful of the contribution Professor Godbey has made to the livestock development of South Carolina. He has accomplished much when it was not easy to do so. We express our appreciation to him for this. We request the Secretary of the S-10 to write a letter of appreciation from the Committee to Professor Godbey and send copies to Dr. R. F. Wheeler, Head of the Animal Husbandry Department, and to Dr. O. B. Garrison, Director of the South Carolina Experiment Station, Clemson, South Carolina.

This meeting marks the tenth anniversary of the S-10 Committee. It has often been cited as an excellent example of the right kind of regional cooperation. The success has been due to the fine cooperative spirit, not only among the Technical Committeemen, but equally so among the workers as well. We realize, however, that a great deal of credit for the success of the Southern Regional Beef Cattle Breeding Project should go to the few who helped organize the project and who guided it during its first few years. We, therefore, request the Secretary to send a copy of our Annual Report, together with a letter of appreciation, to each of those who are not now members of the S-10 Committee who helped organize the project and who helped guide it through its first three years of operation. Minutes of the first three meeting show these to be as follows:

| | |
|---|---|
| Dr. R. T. Clark | Dr. H. A. Stewart |
| Dr. H. S. Work | Dr. W. G. Kirk |
| Mr. F. S. Chance | Dr. B. A. Warwick |
| | Mr. Z. A. Massey |

Drs. Kincaid, Hobbs and Gifford are present members that were instrumental in establishing the S-10 Project.

Submitted by:

B. L. Southwell, Chairman
C. S. Hobbs
J. A. Gaines

A motion to accept the report of the resolutions committee was made, seconded and passed.

Dr. Marvin Koger was elected to the Executive Committee to succeed Dr. Warren Gifford whose term of office expires January 31, 1959.

An invitation to the Technical Committee was given by Mr. Southwell to hold next year's meeting in Georgia and an invitation was also extended from Dr. Godbey for the Technical Committee to hold its meeting in South Carolina next year. Dr. Hobbs moved that the 1959 Annual Meeting of the S-10 Technical Committee be held at the Coastal Plain Experiment Station, Tifton, Georgia. The motion was seconded by Dr. Koger. The motion was carried.

The meeting was adjourned by the Chairman at 12:00 noon.

DATA ON CURRENT ALLOCATIONS AND EXPENDITURES IN FISCAL 1958

| State | Allocation Federal Funds to S-10 Fiscal 1958-59 RRF | AHRD | Expenditures Fiscal 1957-58 State | Federal RRF | AHRD |
|---|---|---|---|---|---|
| Alabama | 10750 | 2400 | 40397 | 10750 | 2400 |
| Arkansas | 11000 | 3000 | 84967 | 9000 | 3000 |
| Florida | 6000 | 2500 | 22700 | 6000 | 2500 |
| Georgia | 6000 | 4640 | 17000 | 6000 | 4640 |
| Kentucky | 9300 | | 25000 | 9212 | |
| Louisiana | 6000 | | 58405 | 6000 | |
| Maryland | | | 39900 | | |
| Mississippi | 8000 | 2400 | 34000 | 4800 | 2400 |
| North Carolina | 9350 | 1800 | 66750 | 9350 | 1800 |
| South Carolina | | | 10900 | | |
| Tennessee | 9500 | 11400 | 23000 [1] | 9500 | 5400 |
| Texas | 10000 | 8200 | 182215 | 10000 | 8200 |
| Virginia | 6000 | 6100 | 22250 | 6000 | 6100 |
| West Virginia | | | | | |
| FEDERAL-STATE COOPERATIVE STATIONS | | | | | |
| Brooksville, Fla. | | | 22942 | | 36709 |
| Jeanerette, La. | | | 39974 | | 32600 |
| Front Royal, Va. | | | 55000 | | 32495 |
| TOTALS | 91900 | 42440 | 745400 | 86612 | 138244 |

1 Does not include receipts which are also used at all stations and substations to support the work

1957-58

| State | Cattle Inventory July 1, 1958* | | | | | | Cattle Fed After Weaning Under Test 1957-58 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cows 2 yrs & over | Yearling heifers | Calves under 1 yr | Bulls over 1 yr | Steers 1 yr & over | % used on project | Bulls Fed Ind. | Bulls Fed Group | Steers Fed Ind. | Steers Fed Group | Heifers Fed Ind. | Heifers Fed Group |
| Alabama | 188 | 28 | 134 | 19 | 16 | 100% | | 24 | | | | 56 |
| Arkansas | 263 | 78 | 142 | 28 | | 100% | | 77 | | | | 105 |
| Florida | | | | | | | | | | | | |
| Gainesville | 40 | 4 | 8 | 3 | | 100% | | | | | | |
| Ona | 235 | 83 | 146 | 27 | 9 | 23% | | 5 | | 4 | | 36 |
| Brooksville | 234 | 80 | 174 | 37 | 48 | 100% | | 23 | | | | 48 |
| Georgia | 338 | 103 | 235 | 35 | | 100% | | | 41 | | | 55 |
| Kentucky | 30 | 6 | 14 | 1 | | 100% | | 30 | | 16 | | |
| Louisiana | | | | | | | | | | | | |
| Baton Rouge | 377 | 85 | 188 | | | 100% | | | | | | 61 |
| Jeanerette | 274 | 82 | 152 | 24 | 40 | | | 28 | | | | |
| Maryland** | 74 | 17 | 56 | 2 | 29 | 75% | | | | 17 | 12 | 8 9 |
| Mississippi | 1026 | 185 | 623 | 39 | 305 | 42% | | | | | 25 | |
| North Carolina | 253 | 43 | 169 | 16 | 46 | 12% | | | 17 | | 18 | 60 |
| South Carolina | 64 | | 62 | 2 | | 70% | | | | | | |
| Tennessee | 1069 | 189 | 793 | 82 | 211 | 94% | | | 50 | 36 | 15 | 202 |
| Texas | 459 | 126 | 362 | 49 | 59 | 100% | | | 273 | | 97 1 | 153 |
| Virginia | | | | | | | | | | | | |
| Blacksburg | 166 | 9 | 153 | 10 | 61 | 72% | | | | | 68 | 79 |
| Front Royal | 419 | 95 | 205 | 32 | | 100% | | 42 | 9 | | | 140 |
| West Virginia | | | | | | | | | | | | |
| TOTAL | 5509 | 1213 | 3616 | 406 | 824 | | | 205 | 414 | 73 | 365 24 | 939 |

* Includes all cattle of each station, whether owned by state, Animal Husbandry Research Division
** Does not include cattle in an outside cooperating herd.

# Summary of Data Related to Efficiency of Milk Utilization by Beef Calves.

by
Kenneth Drewery, C. J. Brown, and R. S. Honea

The studies of mothering ability of beef cows conducted at the Arkansas Station have provided data on milk production and calf weights during the early months of lactation. These data allow estimation of the efficiency with which individual calves are able to utilize milk for growth. The data summarized here were collected as a part of a study dealing with nursing behavior as related to mothering ability and milk production.

During the spring of 1957, milk records, calf weights and nursing behavior of 27 Aberdeen Angus cows and calves were observed in the first, second and third months of lactation., Similar observations were obtained on 21 Aberdeen Angus cows and calves during the spring of 1958. In 1957 the calves were born during a 37-day interval in February and March and were from dams ranging in age from 3 to 13 years. In 1958 the calves were born during a 32-day interval in February and March and were from dams ranging in age from 3 to 11 years. Eight cows were observed in both 1957 and 1958.

Daily milk production was determined from the difference between calf weight taken before and after nursing on a day near the middle of each month. Time and frequency of nursing was observed approximately three days later. A mothering score was assigned each dam at the time of calving to indicate her protectiveness toward her calf according to the scale indicated in Table 1. Gains and efficiency were computed using the pre-nursing weight of the calf.

In Table 1 are shown the average observations on growth, behavior and efficiency of calves calculated from data taken during the 1st, 2nd, and 3rd month of lactation. The observations taken on weights and gains of calves are quite similar in the two years as might be expected since management of the cows and calves was the same. Average daily milk production was slightly higher in 1958 than in 1957 and would be consistent with the age difference observed. Difference between months in time spent nursing was not as pronounced in the 1958 observations as in the 1957 observations but were in the same direction. Efficiency as calculated from estimated number of pounds of milk required to make a pound of gain is quite comparable to that which has been observed for stall fed dairy calves. The efficiency figure 27.38 shown the first month of 1958 is somewhat misleading since this figure is distorted by one calf which failed to gain from birth until the first sample. When the record of this calf was eliminated the average efficiency for the first month was 10.45.

Correlations between milk required per pound of gain and other observations are shown in Table 2. Except for birth weight, in general, the correlations between weights and gains and efficiency are low, significant and negative. Birth weight and nursing behavior did not appear to be associated with efficiency. Milk production of dam, however, appeared to be positively associated with efficiency. The magnitude of the correlations between average daily milk production and efficiency increased from .35 at one month to .68 by the third month of lactation. Correlations between age of dam and efficiency would appear to be consistent with this positive relationship which would indicate that the calves nursing higher producing cows made the least gain for a given volume of milk. Such would be the expected if the percentage of butterfat was lower in the milk of high producing cows. Because of the difficulties of sampling it was

not possible to obtain a reliable estimate of butterfat percentage. Of speculative interest is the correlation between mothering score and efficiency which although low appears to increase in magnitude from the first to the third month. This observation would indicate a tendency for the cows with the stronger protective nature at birth to produce calves requiring fewer pounds of milk to make a pound of gain.

TABLE 1. Average Observations on Growth and Behavior of Aberdeen-Angus Cows and Calves.

| | 1957 Month of Lactation | | | 1958 Month of Lactation | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| Number of Calves Observed | 27 | 27 | 27 | 21 | 21 | 21 |
| Lact. No. | 2.63 | | | 2.48 | | |
| Age of Dam (mo.) | 63.96 | | | 54.66 | | |
| Mothering Score[1] | 2.10 | | | 2.14 | | |
| Birth Weight (lbs.) | 58.15 | | | 54.71 | | |
| Calf wt. at sampling (lbs) | 80.93 | 120.70 | 166.00 | 76.90 | 121.26 | 164.55 |
| Total gain from birth to sampling (lbs) | 22.78 | 62.56 | 107.85 | 22.19 | 66.55 | 109.83 |
| Gain from last sample (lb) | | 39.78 | 45.26 | | 44.36 | 43.28 |
| Age of calf (day) | 17.33 | 44.30 | 74.30 | 19.71 | 54.71 | 83.71 |
| Ave. daily M/P of dam (lb) | 14.50 | 14.81 | 17.22 | 13.64 | 13.62 | 14.36 |
| Total time nursed (min. per day) | 38.50 | 54.86 | 66.74 | 39.28 | 40.24 | 42.00 |
| No. times nursed per day | 4.70 | 5.11 | 6.00 | 4.52 | 3.76 | 3.19 |
| Interval between nursing (min.) | 180.50 | 195.41 | 168.77 | 206.81 | 281.67 | 357.14 |
| Lbs. Milk/Lb. gain | 14.00 | 9.84 | 11.61 | 27.38 | 10.84 | 9.70 |

[1] Where a score of 1= Very nervous and would fight; 2 = attentive but would not fight; 3 = not particularly attentive but would claim calf; and 4 = disown calf

TABLE 2. Correlations Between Milk Required Per Pound of Gain and Data on Growth and Behavior of Aberdeen-Angus Cows and Calves

| YEAR | 1957 | | | 1958 | | | Intra-Year | | |
|---|---|---|---|---|---|---|---|---|---|
| Month in Lactation | Month of Lactation | | | Month of Lactation | | | Month of Lactation | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| No. Calves Observed | 27 | 27 | 27 | 21 | 21 | 21 | | | |
| Lact. No. | -.09 | .21 | .23 | .12 | .26 | .58** | .07 | .24 | .39** |
| Age of Dam (mo) | -.13 | .02 | .19 | .16 | .20 | .66** | .09 | .20 | .40** |
| Mothering score | .14 | -.21 | -.37 | .04 | -.32 | -.28 | .05 | -.26 | -.34* |
| Birth weight | .10 | .07 | -.09 | .23 | .16 | .39 | .17 | .12 | .12 |
| Calf wt. at sampling | -.41* | -.44* | -.38* | -.45* | -.07 | .18 | -.28* | -.28* | -.19 |
| Total gain from birth to sampling | -.49** | -.51** | -.38* | -.55** | -.17 | .01 | -.38* | -.35* | -.24 |
| Gain from last sample | | -.60** | -.46* | | -.19 | -.17 | | -.37** | -.33* |
| Age of calf | -.35 | -.35 | -.43* | -.36 | -.04 | -.47 | -.24 | -.20 | -.44** |
| Ave. daily milk prod. of dam | .16 | .42* | .69** | .49* | .52* | .69** | .35* | .48** | .68** |
| Total time nursed | -.36 | -.27 | .33 | -.30 | .38 | .32 | -.28* | -.04 | .32* |
| No. of times nursed | -.32 | -.42* | .15 | -.30 | .26 | -.26 | -.23 | -.17 | .05 |
| Interval between nursing | .13 | .31 | .05 | .30 | -.49* | .32 | .23 | -.10 | .20 |

* Significant (P less than .05)

** Highly significant (P less than .01)

## Summary of Individual Feeding Trials of Bulls

by
C. J. Brown, Warren Gifford, M. L. Ray and R. S. Honea

Weaning was initiated in 1948 at the Arkansas Station. Since that time 295 calves from 39 sires have been individually fed and data recorded that would allow the computation of the efficiency with which individual bulls use feed for gains. Except for Group I the procedures for feeding and handling during the test has differed very little from one contemporary group of bulls to another. Hand feeding to the limit of feed intake for each individual has been practiced. In all groups prairie hay has made up one third of the ratio There has been some changes in the proportions of grains in the grain mix but in all tests it has been a ration of approximately 12 percent protein and 77 percent TDM. The grain ration currently being used is made up of:

800# crimped corn
400# crimped oats
400# 41% cottonseed meal
300# wheat bran
100# 17% alfalfa meal

Eleven contemporary groups of bulls have been fed. Group I differs from the other groups in that each calf was placed on test exactly when he reached 244 days of age and received varying ratios of grain to roughage. In other groups several bulls have been started on a date when their average age was approximately eight months. In no case does the starting dates differ by mo than 28 days for bulls considered as a contemporary group. Most of the bulls tested have been from Experiment Station herds. Bulls from cooperating bree ers in the state are tested on request and have made up approximately one-fi of the total number tested.

An index which gives equal emphasis to 120 day weight, average daily ga on test, feed per pound of gain on test, and final type score is used to determine which of the station owned bulls are sold in the Annual Experiment Station Performance Tested Bull Sale. This index and the performance record which include efficiency of feed utilization have been included in the sale catalogue for each of the 8 performance tested sales that have been conducte Because many of the bulls and cows in the Experiment Station herds now have several tested progeny, recent catalogues have contained in addition such progeny performance records as are available for ancestors in a three generation pedigree.

The average performance of the 11 contemporary groups of bulls tested i shown in Table 1. Over all groups the range of variation in reach of the performance characteristics is quite striking. For example the most efficie individual required only 5.38 pounds to make a pound of gain whereas the least efficient individual required 14.30 pounds of feed to make a pound of gain. The range of sire differences for average daily gain and feed efficiency are shown in Tables 2 and 3 respectively. These tables also indicate the differences in different samples of progeny of a sire for gain and efficiency on test over several seasons.

The analyses of data to determine relationships among feed consumption, gain and feed efficiency of bulls on performance test are shown in Tables 4, 5, 6 and 7. The interpretation of these analyses are of a preliminary natu

In table 4 is shown the gross and within group correlations among feed consumption, gain, and efficiency when corrected for age and weight. It is of interest that the correlation between feed consumption and gains is changed very little in these data by corrections for age and weight. Correlations of feed consumption and gains with efficiency were increased slightly by the age and weight corrections. The correlation of about .6 between feed consumption and test gains would indicate that approximately 36 percent of the variation in gains were associated with differences in feed consumption. This seems low in view of the standardized conditions under which these bulls were fed. The gross correlation between feed consumption and efficiency was positive whereas on a within group basis it was negative. In both cases the values were low. The correlations between test gain and efficiency were rather high negative values. How should we reconcile these values which involve a part whole relationship with the correlations between feed consumption and gain which are of lower order?

In table 5 are shown estimates of heritability which were calculated as paternal half-sib estimates from analyses of variance of the same data which included progeny of 22 different sires tested in 6 seasons. The heritability estimates calculated from uncorrected data were high. When each record was expressed as a percentage of the contemporary group with which they were tested the estimates were lower for score (.47) gain (.39), and weight per day of age (.45) but higher for initial test weight (1.81), feed consumption (1.91) and feed efficiency (.92). Such estimates would suggest that high heritability estimates for feed efficiency may be related to failure to properly evaluated environmental effects influencing feed consumption.

Some indications of the relationship of size to feed consumption and gains are shown in table 6. This table shows the average feed consumption and gains of bulls tested in four seasons expressed per unit of weight, per unit of metabolic body size (W 3/4) and per unit of surface area (W 2/3) for a 42 day period near the beginning and a 42 day period at the end of the 154 day test period. Correlations were calculated between the values expressed for the two periods. These correlations indicate that there is considerable difference in the relationship of the two periods selected in different seasons. Correlations between periods using variables involving feed consumption expressed per unit of some function of body weight were quite similar to the correlation between feed consumption for the two periods. The single exception to this is seen in group VIII. In a similar manner the correlations between periods using variables which expressed average daily gain per unit of some function of body weight were quite similar between average daily gain for the two periods.

The data from the four groups of bulls indicated in table 6 were further studied by analysis of variance. The mean squares from analysis of variance of the data taken in four seasons are shown in table 7. For the purposes of these analyses the 154 day test period was divided into 5 twenty-eight day periods beginning with the second week of the test. The first two weeks data were omitted from the analysis. In these analyses significant differences between bulls were noted in 3 of the 4 seasons. Differences between periods were significant in 2 of the 4 seasons. Attempts to fit a curve to periods gave inconsistent results. In these analyses for feed consumption there were highly significant differences between bulls and between periods in all cases. There also was a significant bull x period interaction in all seasons. In three of the four seasons a quadratic equation offered the best fit of a curve to describe the trend of feed consumption by periods. In none of the four

seasons were differences between bulls significant nor was the interaction of bulls and periods significant. Differences between periods were significant in three of the four cases but the trend of the curve best describing period variation was not consistent. These analyses would indicate that sire differences and interactions which are apparent in gain and feed consumption data may be obscured in the ratio of these two variables. They also emphasize the fact that feed consumption and gains may not be as closely related as is sometimes assumed under feeding situations where feed is not limited.

TABLE 1. Average Performance of Bulls on Test

| Group No. | No. Bulls | Season | Ave. 120 Day Wt. | Test Gain | ADG | Test Eff. | Score |
|---|---|---|---|---|---|---|---|
| XI | 30 | W | 257 (18) | 304 | 1.97 | 7.68 | 67 |
| X | 39 | S | 245 (36) | 293 | 1.90 | 9.08 | 64 |
| IX | 27 | W | 284 (21) | 355 | 2.31 | 7.96 | 68 |
| VIII | 36 | S | 244 (33) | 339 | 2.20 | 7.81 | 68 |
| VII | 11 | W | 299 (8) | 358 | 2.32 | 7.86 | 73 |
| VI | 37 | S | 241 (31) | 341 | 2.21 | 9.84 | 71 |
| V | 16 | W | 264 (5) | 343 | 2.23 | 9.08 | 69 |
| IV | 27 | S | 243 (27) | 384 | 2.49 | 7.83 | 70 |
| III | 18 | W | 261 (18) | 344 | 2.23 | 8.17 | 72 |
| II | 16 | S | 234 (13) | 318 | 2.06 | 8.35 | 73 |
| I | 40 | - | 271 (40) | 274 | 1.78 | 9.04 | 70 |
| Range of Ind. | | | 139 to 399 | 139 to 487 | .90 to 3.16 | 5.38 to 14.30 | 51-84 |

Table 2. Average Daily Gains of Bulls Fed on Performance Test

| Sire | Breed | Group 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| El 299 | A | $1.73^{5}$ | | | | | | | | | | | $1.73^{5}$ |
| PSB 308 | A | $1.47^{5}$ | | | | | | | | | | | $1.47^{5}$ |
| PSB 57 | A | $1.51^{5}$ | | | | | | | | | | | $1.51^{5}$ |
| Highland | H | $1.59^{5}$ | | | | | | | | | | | $1.59^{5}$ |
| F.L. 161 | H | | $2.19^{3}$ | | | | | | | | | | $2.19^{3}$ |
| Duke | H | $1.79^{5}$ | $2.10^{2}$ | $2.22^{2}$ | | | | | | | | | $1.95^{9}$ |
| Bar. Pr. | A | $1.90^{5}$ | | $1.83^{1}$ | | | | | | | | | $1.89^{6}$ |
| K.E. 2nd | A | | | $2.06^{4}$ | $2.46^{4}$ | | | | | | | | $2.26^{8}$ |
| Bi. Pr. | A | | | | | $2.21^{4}$ | | | | | | | $2.24^{4}$ |
| El.B.Bi. | A | | | | | $2.17^{4}$ | | | | | | | $2.47^{4}$ |
| P.Ban.Bi. | A | | | | | $2.21^{3}$ | | | | | | | $2.21^{3}$ |
| F-80 | A | | | $2.50^{1}$ | $2.19^{2}$ | $1.82^{2}$ | | | | | | $1.86^{8}$ | $1.95^{13}$ |
| Aloes Ev.Pr. | A | | | | | | $2.29^{3}$ | | | | | | $2.29^{3}$ |
| E.E.Vic.T. | H | | | | | | $1.95^{3}$ | | | | | | $1.95^{3}$ |
| Nobleman | SH | | | $2.81^{1}$ | $2.43^{1}$ | | $2.27^{3}$ | | | | | | $2.41^{5}$ |
| Barman | A | | | | | | $2.25^{4}$ | | | | | | $2.25^{4}$ |
| U195 | A | | | | $2.16^{1}$ | | | | $2.60^{1}$ | | | | $2.38^{2}$ |
| U221 | H | | | | $2.58^{3}$ | $1.82^{1}$ | $2.22^{3}$ | $2.27^{1}$ | $2.15^{6}$ | | | | $2.24^{14}$ |
| Blk.Peer | A | | | | | | | | $2.63^{3}$ | | | | $2.63^{3}$ |
| U267 | H | | | | | | | | $2.39^{6}$ | $2.62^{5}$ | | | $2.49^{11}$ |
| U295 | H | | | | | | | | | $1.86^{1}$ | | | $1.86^{1}$ |
| U268 | H | | | | | | | | $1.94^{2}$ | $1.96^{3}$ | | | $1.95^{5}$ |
| ZH 42nd | H | | | | | | | | | $1.96^{6}$ | | | $1.96^{6}$ |
| RH 8 | A | | | | | | | | | | $1.73^{6}$ | | $1.73^{6}$ |
| FL 1st | H | $2.38^{5}$ | $1.94^{6}$ $2.37^{3}$ | | $2.59^{6}$ | | $2.27^{6}$ | $2.45^{1}$ | $2.10^{3}$ | $2.51^{1}$ | $2.25^{1}$ | | $2.29^{32}$ |
| Eric | A | $1.85^{5}$ | $2.12^{5}$ $2.22^{6}$ | | $2.51^{9}$ | $2.35^{2}$ | $2.28^{10}$ | $2.16^{1}$ | $2.17^{9}$ | $2.50^{5}$ | $2.08^{6}$ | $1.96^{5}$ | $2.22^{63}$ |
| Mac | A | | | | | | $2.05^{5}$ | $2.34^{5}$ | $2.23^{2}$ | $2.24^{2}$ | $1.78^{2}$ | $1.60^{1}$ | $2.12^{17}$ |
| 2 | A | | | | | | | | | | $1.55^{4}$ | | $1.55^{4}$ |
| DW 249 | H | | | | | | | | $2.44^{3}$ | | $1.73^{3}$ | | $2.09^{6}$ |
| DM 82nd | H | | | | | | | | | | $2.10^{10}$ | $2.06^{4}$ | $2.09^{14}$ |
| Coronet | SH | | | | | | | | | | $1.80^{3}$ | | $1.80^{3}$ |
| U241 | A | | | | | | | | $1.99^{3}$ | $2.23^{1}$ | $2.10^{1}$ | | $2.06^{5}$ |
| U336 | A | | | | | | | | | | $1.89^{3}$ | | $1.89^{3}$ |
| C.11 | H | | | | | | | | | | | $2.36^{4}$ | $2.36^{4}$ |
| M.M. | H | | | | | | | | | | | $2.18^{2}$ | $2.18^{2}$ |
| El. 415 | A | | | | | | | | | | | $1.90^{5}$ | $1.90^{5}$ |
| B.Kt. 160 | A | | | | | | | | | | | $1.33^{1}$ | $1.33^{1}$ |
| Pr. 20H | A | | | | | | | $2.80^{3}$ | | | | | $2.80^{3}$ |
| Ave. | | $1.78^{40}$ | $2.06^{16}$ $2.24^{18}$ | | $2.49^{26}$ | $2.23^{16}$ | $2.21^{37}$ | $2.45^{11}$ | $2.21^{35}$ | $2.30^{27}$ | $1.90^{39}$ | $1.97^{30}$ | $2.12^{295}$ |

| Sire | Breed | Group 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| El 299 | A | 8.95$^{5}$ | | | | | | | | | | | 8.95$^{5}$ |
| PSB 308 | A | 9.88$^{5}$ | | | | | | | | | | | 9.88$^{5}$ |
| PSB 57 | A | 10.24$^{5}$ | | | | | | | | | | | 10.24$^{5}$ |
| Highland | H | 9.92$^{5}$ | | | | | | | | | | | 9.92$^{5}$ |
| F.L. 161 | H | | 7.17$^{3}$ | | | | | | | | | | 7.17$^{3}$ |
| Duke | H | 8.50$^{5}$ | 8.13$^{2}$ | 7.36$^{2}$ | | | | | | | | | 8.16$^{9}$ |
| Bar.Pr. | A | 8.22$^{5}$ | | 8.24$^{1}$ | | | | | | | | | 8.22$^{6}$ |
| K.E. 2nd | A | | | 8.96$^{4}$ | 8.20$^{4}$ | | | | | | | | 8.58$^{8}$ |
| Bi. Pr. | A | | | | | 8.55$^{4}$ | | | | | | | 8.55$^{4}$ |
| El.B.Bi. | A | | | | | 8.11$^{4}$ | | | | | | | 8.11$^{4}$ |
| Pr.B.Bi. | A | | | | | 9.81$^{3}$ | | | | | | | 9.81$^{3}$ |
| F-80 | A | | | 7.72$^{1}$ | 8.00$^{2}$ | 9.64$^{2}$ | | | | | | 7.59$^{8}$ | 7.98$^{13}$ |
| A.Ev.Pr. | A | | | | | | 9.47$^{3}$ | | | | | | 9.47$^{3}$ |
| E.E.Vic.T. | H | | | | | | 12.55$^{3}$ | | | | | | 12.55$^{3}$ |
| Nobleman | SH | | | 7.51$^{1}$ | 8.52$^{1}$ | | 9.60$^{3}$ | | | | | | 8.97$^{5}$ |
| Barman | A | | | | | | 10.12$^{4}$ | | | | | | 10.12$^{4}$ |
| U195 | | | | | 7.92$^{1}$ | | | | 6.48$^{1}$ | | | | 7.20$^{2}$ |
| U221 | H | | | | 7.60$^{3}$ | 9.57$^{1}$ | 9.09$^{3}$ | 7.56$^{1}$ | 7.73$^{6}$ | | | | 8.11$^{14}$ |
| Blk.Peer | A | | | | | | | | | 7.17$^{3}$ | | | 7.17$^{3}$ |
| U267 | H | | | | | | | | 7.66$^{6}$ | 6.98$^{5}$ | | | 7.35$^{11}$ |
| U295 | H | | | | | | | | | 9.24$^{1}$ | | | 9.24$^{1}$ |
| U268 | H | | | | | | | | 7.90$^{2}$ | 8.25$^{3}$ | | | 8.11$^{5}$ |
| ZH 42nd | H | | | | | | | | | 9.12$^{6}$ | | | 9.12$^{6}$ |
| R.H. 8 | A | | | | | | | | | | 10.18$^{6}$ | | 10.18$^{6}$ |
| FL 1st | H | 7.87$^{5}$ | 8.90$^{6}$ 7.85$^{3}$ | | 7.82$^{6}$ | | 9.63$^{6}$ | 8.02$^{1}$ | 7.51$^{3}$ | 5.38$^{1}$ | 7.31$^{1}$ | | 8.26$^{32}$ |
| Eric | A | 8.80$^{5}$ | 8.49 5 8.23$^{6}$ | | 7.76$^{9}$ | 10.20$^{2}$ | 9.04$^{10}$ | 7.96$^{1}$ | 7.89$^{9}$ | 8.00$^{5}$ | 8.45 $^{6}$ | 7.64$^{5}$ | 8.32$^{63}$ |
| Mac | A | | | | | | 10.67$^{5}$ | 7.67$^{5}$ | 8.62$^{2}$ | 7.98$^{2}$ | 10.17 $^{2}$ | 7.95$^{1}$ | 9.07$^{17}$ |
| 2 | A | | | | | | | | | | 11.40$^{4}$ | | 11.40$^{4}$ |
| DW 249 | H | | | | | | | | 8.06$^{3}$ | | 8.32$^{3}$ | | 8.19$^{6}$ |
| DM 82 | H | | | | | | | | | | 7.86$^{10}$ | 6.88$^{4}$ | 7.58$^{14}$ |
| Coronet | SH | | | | | | | | | | 9.94$^{3}$ | | 9.94$^{3}$ |
| U241 | A | | | | | | | | 7.99$^{3}$ | 8.44$^{1}$ | 8.70$^{1}$ | | 8.22$^{5}$ |
| U336 | A | | | | | | | | | | 9.01$^{3}$ | | 9.01$^{3}$ |
| Cod. 11 | H | | | | | | | | | | | 7.77$^{4}$ | 7.77$^{4}$ |
| Mellow | H | | | | | | | | | | | 7.29$^{2}$ | 7.29$^{2}$ |
| E. 415 | A | | | | | | | | | | | 8.02$^{5}$ | 8.02$^{5}$ |
| B.Knt.160 | A | | | | | | | | | | | 10.15$^{1}$ | 10.15$^{1}$ |
| Pr.20H | A | | | | | | | 7.77$^{3}$ | | | | | 7.77$^{3}$ |
| Ave. | | 9.05$^{40}$ | 8.35$^{16}$ 8.16$^{18}$ | | 7.88$^{26}$ | 9.08$^{16}$ | 9.84$^{37}$ | 7.84$^{11}$ | 7.82$^{35}$ | 7.96$^{27}$ | 9.08$^{39}$ | 7.68$^{30}$ | 8.53$^{295}$ |

Table 4. Correlations Among Feed Consumption, Test Gain, and Efficiency of 154 Bulls Fed During 6 Seasons.

| | Uncorrected | Age Corrected | Age & Wt. Corrected |
|---|---|---|---|
| **Feed Consumption - Test Gains** | | | |
| Gross | .61 | .62 | .61 |
| Within Contemporary Group | .61 | .60 | .59 |
| **Feed Consumption - Efficiency** | | | |
| Gross | .19 | .22 | .25 |
| Within Contemporary Group | -.07 | -.16 | -.33 |
| **Test Gain - Efficiency** | | | |
| Gross | -.60 | -.52 | -.54 |
| Within Contemporary Group | -.72 | -.83 | -.82 |

Table 5. Heritability Estimates of Certain Performance Traits of Bulls Individually Fed on Gain Evaluation Tests - 154 Bulls from 22 Different Sires Fed During 6 Seasons.

| Trait | Uncorrected Data | Data Expressed as a Percent of the Contemporary Group |
|---|---|---|
| Initial Weight | 1.36 | 1.81 |
| Score | .83 | .47 |
| Feed Consumption | 1.04 | 1.91 |
| Gain | .57 | .39 |
| Feed/lb. Gain | .86 | .92 |
| Wt./Day of Age | 1.08 | .45 |

Table 6. Relationship of Size to Feed Consumption and Gains Taken During Two 42-Day Periods Selected Toward the Beginning and End of the 154-Day Performance Test.

| Season | S Gp. VIII | | | W Gp. IX | | | S GP. X | | | W GP. XI | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Bulls | 35 | | | 27 | | | 39 | | | 27 | | |
| Period | 1 | 2 | r | 1 | 2 | r | 1 | 2 | r | 1 | 2 | r |
| Av. Wt. (lbs) | 466 | 653 | - | 580 | 776 | - | 484 | 649 | - | 532 | 694 | - |
| Av. Wt. (kg) | 211 | 296 | - | 263 | 352 | - | 220 | 290 | - | 241 | 315 | - |
| Av. DFC (kg) | 7.15 | 9.24 | .55* | 7.77 | 9.30 | .85** | 7.27 | 8.81 | .29 | 6.49 | 7.76 | .86** |
| FC/kg. wt. | .0338 | .0314 | .02 | .0300 | .0267 | .77** | .0336 | .0306 | .28 | .0271 | .0248 | .66** |
| FC/W 3/4 | .1284 | .1298 | -.21 | .1201 | .1151 | .68** | .1288 | .1258 | .07 | .1064 | .1041 | .51** |
| FC/W 2/3 | .2011 | .2085 | -.16 | .1908 | .1875 | .67** | .2019 | .2019 | .05 | .1679 | .1680 | .51** |
| ADG (lbs) | 2.03 | 2.28 | -.07 | 2.42 | 1.78 | .39* | 1.90 | 1.90 | .03 | 1.98 | 2.10 | .19 |
| ADG/kg. wt. | .0097 | .0077 | -.01 | .0096 | .0052 | .65** | .0088 | .0066 | .03 | .0082 | .0067 | -.02 |
| ADG/W 3/4 | .0368 | .0322 | -.12 | .0381 | .0225 | .73** | .0337 | .0273 | .18 | .0324 | .0282 | -.09 |
| ADG/W 2/3 | .0575 | .0516 | - .16 | .0605 | .0366 | .71** | .0529 | .0438 | .17 | .0511 | .0456 | -.09 |

Table 7. Analysis of Variance of Gain, Feed Consumption, and Feed Per Lb. of Gain of Test Data Classified into 5 Periods.

Group VIII

| Source | D/F | MS Gain | MS Consu. | MS Feed/Lb. of Gain |
|---|---|---|---|---|
| Bet Periods | (4) | 3.79** | 89575:59** | 85.44** |
| Linear | 1 | 3.39* | 356087.06** | 12:27 |
| Quadratic | 1 | 7.60** | 1363:60 | 239.47** |
| Cubic | 1 | 4:07** | 769:65 | 72.69 |
| Quartic | 1 | :09 | 82.03 | 17.32 |
| Bet. Bulls | 34 | .89* | 7630.77** | 17.35 |
| Bulls x Periods | 136 | .54 | 774:21** | 19.90 |
| Remainder | 175 | .83 | 275.97 | 29.37 |

Group IX

| | | | | |
|---|---|---|---|---|
| Bet. Periods | (4) | 45.18** | 44685:47** | 696:90** |
| Linear | 1 | 6:46** | 173666:40** | 1886.68** |
| Quadratic | 1 | 4.91** | 4625:53** | 237:71* |
| Cubic | 1 | 22:52** | 448:27 | 454:26** |
| Quartic | 1 | 11:29** | 1:69 | 208:95 |
| Bet. Bulls | 26 | 1:25** | 11213:93** | 66:39 |
| Bulls x Periods | 104 | :36 | 394:54** | 54:35 |
| Remainder | 135 | 1,034 | 192.56 | 85.76 |

Group X

| | | | | |
|---|---|---|---|---|
| Bet. Periods | (4) | 1.09 | 57012:00** | 79:76 |
| Lin. | 1 | 1.53 | 221359:00** | 166.14 |
| Quad. | 1 | .09 | 4233:00* | 66.37 |
| Cubic | 1 | 1.93 | 2217.00 | 33.32 |
| Quartic | 1 | :63 | 283:00 | 53:20 |
| Bet. Bulls | 38 | .78 | 3683.00** | 99.97 |
| Bulls x Periods | 152 | .56 | 793.00** | 78.01 |
| Remainder | 195 | .90 | 266.00 | 106.67 |

Group XI

| | | | | |
|---|---|---|---|---|
| Bet. Periods | (4) | .470 | 23718:34** | 97.64 |
| Linear | 1 | .858 | 92250:67** | 299.50** |
| Quad. | 1 | .818 | 2208.02** | 10.52 |
| Cubic | 1 | :201 | 410:82 | 43:53 |
| Quartic | 1 | :001 | 3:87 | 37:02 |
| Bet. Bulls | 26 | :793** | 7070.72** | 13.73 |
| Bulls x Periods | 104 | .287 | 218:67** | 12.12 |
| Remainder | 135 | .575 | 88.59 | 24.22 |

Summary of Digestion Studies on Individually Fed Yearling Bulls.

by

C. J. Brown, M. L. Ray, and W. H. Wallace

At the end of performance tests conducted in Summer 1957 and Winter 195[illegible] 58, two bulls from each of 12 sire groups were selected for a study of the re lationship of the digestibility of chemical components of the test ration to previous performance on test. Four sire groups of Herefords and eight sire groups of Aberdeen Angus that differed widely in pedigree were used. These bulls had completed a performance test of 154 days in which they had been individually fed a ration which consisted of one-third prairie hay and two-thi grain mix. Four bulls (2 sire groups of 2 bulls each) were placed in digest stalls each week. A two day adjustment period and a five day collection peri was used in the standard procedure to determine digestibility. Standard AOA methods for chemical analysis were followed.

Average digestibility coefficients are presented in Table 1 for sire groups studied. It will be noted that these data are somewhat more variable than similar data reported for steers. This might be expected since several sire groups are represented. Also intact males seemed to adapt themselves less readily to digestion trial procedures. The range of individual variati suggests that certain individuals are considerably superior to others in the ability to digest food nutrients.

Mean squares and estimates of variance components are shown in Tables 2 and 3. These tables illustrate the importance of differences associated wit time and sires. Phenotypic correlations calculated from variance components are high for dry matter (.26), crude protein (.30), and ether extract (.33) and low for crude fiber (.04) and nitrogen free extract (.04).

In table 4 are presented the intra-season correlations between digestibility of chemical components and feed lot performance. The correlations of chemical components with test gain were negative except for CP. This would indicate a tendency for faster gaining bulls to digest their feed less thoroughly than slower gaining bulls. This observation is consistent with t correlations in Table 4 between feed consumption and digestibility which indicates a tendency for bulls who consume large quantities of feed to digest less thoroughly. These observations would suggest that fast gaining cattle may not necessarily make the best use of feed intake.

Table 1. Average percentage digestibility of chemical components of ration by bulls from different sire groups.

| Season | Sire Group | Breed | Chemical Component DM | CP | CF | EE | NFE |
|---|---|---|---|---|---|---|---|
| F | 1 | A | 65.8 | 66.1 | 47.9 | 73.5 | 73.2 |
| F | 2 | A | 65.5 | 65.3 | 52.3 | 64.6 | 72.7 |
| F | 3 | A | 70.1 | 73.3 | 57.4 | 75.0 | 76.8 |
| F | 4 | H | 67.4 | 68.5 | 52.3 | 76.8 | 76.1 |
| F | 5 | H | 71.9 | 71.0 | 58.2 | 75.9 | 78.5 |
| F | 6 | H | 64.8 | 71.8 | 52.4 | 65.7 | 72.4 |
| S | 7 | H | 65.3 | 65.7 | 39.1 | 73.4 | 66.6 |
| S | 8 | A | 67.7 | 66.9 | 44.6 | 74.3 | 69.0 |
| S | 9 | A | 62.0 | 61.5 | 35.5 | 67.2 | 64.2 |
| S | 10 | A | 63.1 | 62.6 | 41.4 | 71.8 | 64.1 |
| S | 11 | A | 65.1 | 60.5 | 44.7 | 80.2 | 64.7 |
| S | 12 | A | 64.7 | 63.1 | 44.9 | 70.2 | 66.1 |
| Range of sire averages: | | | 62.0 to 71.9 | 60.5 to 73.3 | 35.5 to 58.2 | 64.6 to 80.2 | 64.1 to 76.1 |
| Range of individuals: | | | 60.9 to 73.5 | 60.0 to 75.4 | 33.6 to 61.3 | 59.8 to 80.2 | 60.3 to 79.4 |

Table 2. Analysis of Variance of Percentage of Chemical Components of Ration Digested.

| 24 | 3 | 5 | 5 | 5 | 6 | 5 |
|---|---|---|---|---|---|---|
| Source | D/F | DM | CP | EE | CF | NFE |
| Time | 5 | 35.89 | 20.82 | 35.39 | 111.86 | 196.3 |
| Sires within Time | 6 | 11.28 | 10.92 | 51.43 | 7.62 | 24.84 |
| Individuals within Sires | 12 | 3.97 | 4.68 | 25.71 | 5.02 | 19.80 |

Table 3. Estimates of Variance Components Associated with Time, Sires and Individual Bulls for Chemical Components of Ration

| 12 | DM | CP | CF | EE | NFE |
|---|---|---|---|---|---|
| Time | 6.10 | 2.48 | 42.87 | Neg. | 26.06 |
| Sires | 3.65 | 3.12 | 2.52 | 12.86 | 1.30 |
| Individuals | 3.97 | 4.68 | 19.80 | 25.71 | 5.02 |
| Phenotypic Correlations | .26 | .30 | .04 | .33 | .04 |

Table 4. Intra Season Correlations Between Digestibility of Chemical Components of the Ration and Feed Lot Performance.

| | | Test Gain | Test Feed Consumption | Test Eff. | Final Wt. | Eff. at 500 lbs | Eff. final 2 weeks on test |
|---|---|---|---|---|---|---|---|
| DM | F | -.58* | -.60 | .21 | -.55 | .17 | .50 |
| | S | -.21 | .03 | .16 | -.08 | -.03 | -.24 |
| | | -.46* | -.46* | .17 | -.36 | .01 | .02 |
| CP | F | .06 | .07 | .03 | .15 | -.29 | .33 |
| | S | .28 | -.26 | -.42 | .36 | .09 | -.36 |
| | | .14 | .00 | -.22 | .08 | -.00 | -.10 |
| CF | F | -.27 | -.32 | .04 | -.26 | -.04 | .33 |
| | S | -.23 | -.001 | .19 | -.34 | .33 | -.17 |
| | | -.25 | -.21 | .13 | -.28 | .08 | -.04 |
| EE | F | -.67* | -.49 | .42 | -.40 | .34 | .46 |
| | S | -.67* | -.53 | .54 | -.30 | .38 | .12 |
| | | -.67* | -.46* | .49* | -.56* | .39 | .19 |
| NFE | F | -.61* | -.68* | .18 | -.57 | .14 | .48 |
| | S | -.02 | .21 | .002 | .06 | -.21 | -.17 |
| | | -.36 | -.40 | .08 | -.18 | -.12 | .01 |

Summary of Selection Practiced in a Purebred Aberdeen-Angus Herd at the Livestock and Forestry Branch Experiment Station.

by
Elmer Krehbiel, C. J. Brown, Charles Mabry and Warren Gifford

In 1941 forty purebred Aberdeen-Angus heifers were purchased at weaning age to establish a herd of cattle at the Livestock and Forestry Branch Experiment Station for study and evaluation of performance records. Since the herd was established no females have been purchased. As of 1957 there were 50 mature cows and 32 heifers of less than breeding age. During the 16 year period of this study 9 sires were used, 8 of which were purchased from 8 different herds. Pedigrees indicate that in general, a system of mild line breeding has been followed.

Each year except 1947, all cattle in the herd were classified for type in late summer according to the system of type classification described in Ark. Exp. Sta. Bul. 540. At least three judges have evaluated the cattle independently at each time of scoring. A total of 25 judges have appraised the cattle during the 16 year period.

The score used in this study for an animal consisted of the overall score averaged for all judges appraising the animal that year. The data used were the records of all herd sires, foundation females, and the 175 female offspring produced between 1941 and 1957 that could have been contributed to the improvement of type in this herd.

Selection differentials were calculated on the basis of current score, average lifetime score and most probably score. The most probable score was estimated from the formula of Lush (1945) which is equal to

$$\frac{nr}{1 - r + nr} \text{ X (cows average record)} + \frac{1 - r}{1 - r + nr} \text{ x (herd average)}$$

Where n = number of records
r = repeatability

Repeatability was estimated to be .36 for contemporary cows and .42 for non-contemporary cows. The value of .36 for contemporary cows was used in the above formula to obtain the most probable score. Tables (1, 2, and 3) of selection differentials for all three methods of calculation are shown. In general, these values are positive and indicate that selection was directed toward improvement in type. Fewest negative selection differentials were observed when calculations were based on most probable score.

The effectiveness of the selection for type that was practiced is summarized in Table 4. The annual mean scores indicate an improvement of slightly more than a full grade in type by all three methods of calculation over the 16 year period. The value of heritability estimates computed by regression were .33 for offspring on mid-parent, .82 for offspring on dam, .77 for offspring on dam pooled within sire, .24 for offspring on sire. A paternal half-sib estimate of heritability obtained from analysis of variance was .54. The value of .33 obtained as a heritability estimate from regression of offspring on mid-parent was multiplied times the selection differentials to obtain the expected change from the selection practiced during each year.

The expected change from selection each year was then used to determine the expected annual means. Both the expected change and the expected annual mean are shown in Table 4. A comparison of the expected annual mean with the actual mean after 15 years of selection is quite close. The calculations based on average lifetime and most probable scores, slightly over estimated the actual mean whereas calculations based on current scores slightly under estimated the actual mean scores.

The relative size of the selection differential as selection progressed during the period might be of interest. During approximately the first one-third of the study the magnitude of the selection differential increased quite rapidly. Some negative selection for type was noted during 1943.and 1944. During approximately the latter two-thirds of the study the selection differentials have been positive for approximately one-third of a grade for type. Only a very slight upward trend in the magnitude of the selection differential during the latter two-thirds of the period was noted.

Changes in variability of the scores of the herd is indicated by the standard deviations for the three methods of calculation for each year shown in Table 4 and in the frequency distribution of scores shown in Table 5. There was a slight reduction in the size of the standard deviation of scores during the study. This was more pronounced for current scores and average lifetime scores than for most probable score. The range of scores apparent from Table 5 indicates this same pattern in reduction of variability. They also show the movement of the herd up the scale of merit each year by an increase in the number of animals in the higher grades and a decrease in the number of animals in the lower grades.

These data would indicate that selecting for type on the basis of a score card has been effective in improving the type of a small herd of pure-bred Aberdeen-Angus cows. They would seem to offer a basis to predict the rate with which a small breeder may expect to change the type of his cow herd by selection based on a score card where bulls are purchased and female replacements are raised.

Selection Differentials Based on Current Score

| Season Born | Year Scored | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
| 1941 | | -4.6 | 2.3 | 4.4 | 8.4 | 11.9 | 12.6 | 10.4 | 11.5 | 13.7 | 10.2 | 10.4 | 10.5 | 11.0 | 8.7 |
| 1943-44 | | | | 1.0 | 0.9 | 4.3 | 7.3 | 4.1 | 5.0 | 10.7 | 10.7 | 12.2 | 9.2 | 12.7 | 19.7 |
| 1944-45 | | | | | -5.6 | -7.1 | -3.6 | -3.2 | 1.5 | 1.7 | -1.9 | 1.1 | 5.7 | 4.7 | 5.2 |
| 1945-46 | | | | | | 1.5 | -5.1 | 3.5 | 7.9 | 4.2 | 5.2 | 3.2 | | | |
| 1946-47 | | | | | | | -4.2 | -10.2 | -0.9 | 4.1 | 6.1 | 5.1 | 4.1 | 7.1 | 2.1 |
| 1947-48 | | | | | | | -2.2 | 0.9 | 1.1 | -1.2 | 5.4 | 2.6 | 11.1 | 7.9 | 7.2 |
| 1948-49 | | | | | | | | -1.4 | 2.9 | 0.2 | 5.5 | 6.5 | 6.5 | 5.5 | 7.5 |
| 1949-50 | | | | | | | | | 4.7 | 8.2 | 4.1 | 8.8 | 8.4 | 10.7 | 10.6 |
| 1950-51 | | | | | | | | | | -3.7 | -0.4 | -0.3 | -0.2 | 8.7 | 3.7 |
| 1951-52 | | | | | | | | | | | -2.5 | -3.0 | -5.3 | -0.7 | |
| 1952-53 | | | | | | | | | | | | -2.1 | 3.2 | 3.3 | 3.3 |
| 1953-54 | | | | | | | | | | | | | 1.5 | 4.7 | 4.7 |
| 1954-55 | | | | | | | | | | | | | | 1.6 | 2.7 |
| 1955-56 | | | | | | | | | | | | | | | -1.5 |
| 1956-57 | | | | | | | | | | | | | | | |
| Average Differentials | -4.6 | 2.3 | 3.9 | 4.8 | 5.4 | 2.5 | 2.6 | 4.8 | 3.3 | 3.0 | 2.5 | 3.8 | 5.6 | 4.0 | |

Selection Differentials Based on Average Lifetime Score

| Season Born | Year Scored | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
| 1941 | | -2.0 | -0.4 | 0.8 | 2.3 | 5.0 | 6.1 | 6.8 | 8.1 | 8.7 | 9.8 | 9.9 | 10.4 | 10.5 | 11.3 |
| 1943-44 | | | | 0.5 | 0.6 | 2.5 | 3.4 | 3.5 | 5.3 | 5.3 | 5.9 | 6.5 | 6.8 | 7.3 | 6.9 |
| 1944-45 | | | | | -2.8 | -4.0 | -4.1 | -3.7 | -1.4 | -1.0 | -1.1 | -0.9 | 0.5 | 0.9 | 1.3 |
| 1945-46 | | | | | | 0.8 | -1.2 | 1.9 | 3.9 | 3.9 | 2.3 | 2.5 | | | |
| 1946-47 | | | | | | | -2.0 | -3.5 | -3.0 | -1.6 | -0.3 | 0.5 | 1.0 | 1.6 | 1.7 |
| 1947-48 | | | | | | | -1.1 | -0.4 | 0.3 | 0.0 | 2.7 | 2.8 | 4.3 | 2.8 | 2.4 |
| 1948-49 | | | | | | | -1.1 | 0.2 | 0.8 | 6.7 | 6.7 | 6.6 | 6.5 | 6.6 | |
| 1949-50 | | | | | | | | 3.8 | 5.2 | 7.1 | 7.4 | 7.6 | 8.0 | 8.5 | |
| 1950-51 | | | | | | | | | -1.4 | -0.5 | -0.2 | 1.0 | 7.0 | 6.6 | |
| 1951-52 | | | | | | | | | | -1.0 | -1.7 | -2.7 | -2.6 | | |
| 1952-53 | | | | | | | | | | | -2.1 | 1.2 | 2.3 | 2.5 | |
| 1953-54 | | | | | | | | | | | | 1.1 | 3.0 | 3.5 | |
| 1954-55 | | | | | | | | | | | | | 0.8 | 1.6 | |
| 1955-56 | | | | | | | | | | | | | | 0.7 | |
| 1956-57 | | | | | | | | | | | | | | | |
| Average Differentials | -2.0 | -0.4 | 0.8 | 1.1 | 2.2 | 1.6 | 1.8 | 3.1 | 2.4 | 3.0 | 2.2 | 2.8 | 3.8 | 3.4 | |

Selection Differentials Based on Probable Score

| Season Born | Year Scored | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
| 1941 | | -2.1 | -0.5 | 0.9 | 2.4 | 4.7 | 6.2 | 6.5 | 7.8 | 8.4 | 9.4 | 9.5 | 10.0 | 10.2 | 11.0 |
| 1943-44 | | | | 1.5 | 2.9 | 4.7 | 5.8 | 6.0 | 8.0 | 7.9 | 8.5 | 9.1 | 9.5 | 10.00 | 9.6 |
| 1944-45 | | | | | 1.0 | 1.3 | 1.8 | 2.4 | 4.3 | 5.3 | 5.0 | 5.4 | 6.7 | 6.9 | 7.5 |
| 1945-46 | | | | | | 1.7 | 1.1 | 3.4 | 5.3 | 5.5 | 4.8 | 4.7 | | | |
| 1946-47 | | | | | | | -0.2 | -1.0 | -0.7 | 0.4 | 1.4 | 2.5 | 2.7 | 3.3 | 3.4 |
| 1947-48 | | | | | | | 0.5 | 1.3 | 2.1 | 2.2 | 4.3 | 5.0 | 6.1 | 5.0 | 4.7 |
| 1948-49 | | | | | | | | -0.1 | 1.0 | 1.5 | 6.0 | 6.3 | 6.9 | 6.7 | 6.9 |
| 1949-50 | | | | | | | | | 2.2 | 3.5 | 5.0 | 5.5 | 5.9 | 6.8 | 7.1 |
| 1950-51 | | | | | | | | | | 0.2 | 1.2 | 1.5 | 2.8 | 7.6 | 7.9 |
| 1951-52 | | | | | | | | | | | 0.5 | 0.6 | 0.2 | 0.7 | |
| 1952-53 | | | | | | | | | | | | 0.1 | 1.9 | 3.0 | 3.5 |
| 1953-54 | | | | | | | | | | | | | 1.4 | 3.1 | 3.8 |
| 1954-55 | | | | | | | | | | | | | | 1.8 | 3.0 |
| 1955-56 | | | | | | | | | | | | | | | 0.8 |
| 1956-57 | | | | | | | | | | | | | | | |
| Average Differentials | -2.1 | -0.5 | 1.0 | 2.2 | 3.5 | 2.8 | 3.1 | 3.9 | 3.6 | 4.1 | 3.7 | 3.7 | 4.5 | 4.1 | |

## Frequency Distribution of Scores of Animals in Each Year

| Range | Year Scored 1942 | 1943 | 1944 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Current Score** | | | | | | | | | | | | | | | |
| 35-39 | 1 | | | | | | | | | | | | | | |
| 40-44 | 1 | 2 | | 1 | | | | | | | | | | | |
| 45-49 | 3 | 9 | 3 | 4 | | 1 | | | | | | | | | |
| 50-54 | 8 | 10 | 8 | 2 | 1 | 1 | 3 | 4 | 2 | 1 | | 1 | | | |
| 55-59 | 11 | 12 | 8 | 8 | 7 | 10 | 9 | 12 | 4 | 5 | 3 | 8 | 2 | 1 | |
| 60-64 | 5 | 5 | 13 | 9 | 12 | 12 | 13 | 21 | 9 | 12 | 10 | 14 | 10 | 4 | 13 |
| 65-69 | 9 | 1 | 7 | 13 | 18 | 19 | 26 | 24 | 24 | 27 | 22 | 20 | 19 | 15 | 27 |
| 70-74 | 1 | | 4 | 9 | 11 | 11 | 16 | 15 | 25 | 17 | 16 | 26 | 31 | 33 | 21 |
| 75-79 | 1 | | 1 | 2 | 1 | 8 | 4 | 7 | 6 | 12 | 8 | 9 | 15 | 19 | 13 |
| 80-84 | | | | 1 | | 2 | 1 | | 1 | 2 | 1 | 3 | 1 | 1 | 8 |
| 85-89 | | | | | | | | | | | | | 1 | | |
| **Average Lifetime Score** | | | | | | | | | | | | | | | |
| 35-39 | 1 | | | | | | | | | | | | | | |
| 40-44 | 1 | 2 | | | | | | | | | | | | | |
| 45-49 | 3 | 5 | 2 | 2 | | | | | | | | | | | |
| 50-54 | 8 | 9 | 10 | 7 | 4 | 1 | | 3 | | | | | | | |
| 55-59 | 11 | 13 | 15 | 14 | 14 | 11 | 11 | 12 | 5 | 4 | | 1 | 1 | 1 | 1 |
| 60-64 | 5 | 7 | 12 | 11 | 15 | 24 | 29 | 32 | 16 | 17 | 10 | 14 | 7 | 5 | 12 |
| 65-69 | 9 | 3 | 4 | 8 | 11 | 14 | 26 | 27 | 34 | 38 | 34 | 40 | 35 | 26 | 30 |
| 70-74 | 1 | | 1 | 6 | 6 | 12 | 4 | 8 | 14 | 13 | 13 | 20 | 28 | 32 | 30 |
| 75-79 | 1 | | | 1 | | 1 | 2 | 1 | 2 | 3 | 3 | 6 | 8 | 9 | 9 |
| 80-84 | | | | | | 1 | | | | 1 | | | | | |
| **Most Probable Score** | | | | | | | | | | | | | | | |
| 45-49 | | 2 | | | | | | | | | | | | | |
| 50-54 | 5 | 13 | 10 | 7 | 3 | | | | | | | | | | |
| 55-59 | 23 | 21 | 25 | 18 | 14 | 4 | 3 | 3 | 1 | 1 | | | | | |
| 60-64 | 12 | 3 | 9 | 21 | 23 | 41 | 44 | 47 | 23 | 22 | 11 | 15 | 7 | 3 | 7 |
| 65-69 | | | | 3 | 10 | 18 | 24 | 32 | 44 | 47 | 45 | 57 | 57 | 46 | 49 |
| 70-74 | | | | | | 1 | 1 | 1 | 3 | 6 | 4 | 8 | 14 | 23 | 25 |
| 75-79 | | | | | | | | | | | | 1 | 1 | 1 | 1 |

## Summary of Selection Practiced in Purebred Angus Herd at Livestock and Forestry Branch Experiment Station

| | Year Scored | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 |
| | Actual Annual Means | | | | | | | | | | | | | | |
| C. | 58.1 | 53.5 | 60.6 | 63.8 | 65.6 | 66.9 | 65.9 | 65.2 | 68.4 | 68.2 | 68.5 | 68.3 | 70.5 | 71.1 | 70.4 |
| A. | 58.1 | 56.1 | 58.3 | 61.2 | 62.4 | 64.9 | 64.6 | 64.2 | 66.8 | 67.2 | 68.3 | 68.1 | 69.5 | 70.1 | 69.4 |
| P. | 58.1 | 56.0 | 57.8 | 59.9 | 61.5 | 63.5 | 64.0 | 64.1 | 65.7 | 66.2 | 67.1 | 67.1 | 68.1 | 68.8 | 68.7 |
| | Average Selection Differentials | | | | | | | | | | | | | | |
| C. | | -4.6 | 2.3 | 3.9 | 4.8 | 5.4 | 2.5 | 2.6 | 4.8 | 3.3 | 3.0 | 2.5 | 3.8 | 5.6 | 4.0 |
| A. | | -2.0 | -0.4 | 0.8 | 1.1 | 2.2 | 1.6 | 1.8 | 3.1 | 2.4 | 3.0 | 2.2 | 2.8 | 3.8 | 3.4 |
| P. | | -2.1 | -0.5 | 1.0 | 2.2 | 3.5 | 2.8 | 3.1 | 3.9 | 3.6 | 4.1 | 3.7 | 3.7 | 4.5 | 4.1 |
| | Standard Deviations | | | | | | | | | | | | | | |
| C. | 8.33 | 5.86 | 7.30 | 8.86 | 5.29 | 7.33 | 6.44 | 6.30 | 5.47 | 6.02 | 5.22 | 6.41 | 5.29 | 4.91 | 5.90 |
| A. | 8.33 | 5.77 | 5.20 | 6.83 | 5.47 | 5.47 | 4.42 | 4.96 | 2.77 | 4.14 | 3.72 | 4.20 | 3.85 | 4.06 | 4.70 |
| P. | 3.00 | 3.06 | 3.05 | 3.79 | 3.53 | 2.74 | 2.69 | 3.52 | 2.60 | 2.71 | 2.24 | 2.49 | 2.46 | 2.30 | 2.82 |
| Heritability (.33) x Sel. Diff. = | Expected Change | | | | | | | | | | | | | | |
| C. | | -1.5 | 0.8 | 1.3 | 1.6 | 1.8 | 0.8 | 0.9 | 1.6 | 1.1 | 1.0 | 0.8 | 1.3 | 1.8 | 1.3 |
| A. | | -0.7 | -0.1 | 0.3 | 0.4 | 0.7 | 0.5 | 0.6 | 1.0 | 0.8 | 1.0 | 0.7 | 0.9 | 1.3 | 1.1 |
| P. | | -0.7 | -0.2 | 0.3 | 0.7 | 1.2 | 0.9 | 1.0 | 1.3 | 1.2 | 1.4 | 1.2 | 1.2 | 1.5 | 1.4 |
| | Expected Annual Means | | | | | | | | | | | | | | |
| C. | 58.1 | 56.6 | 57.4 | 58.7 | 60.3 | 62.1 | 62.9 | 63.8 | 65.4 | 66.5 | 67.5 | 68.3 | 69.6 | 71.4 | 72.7 |
| A. | 58.1 | 57.4 | 57.3 | 57.6 | 58.0 | 58.7 | 59.2 | 59.8 | 60.8 | 61.6 | 62.6 | 63.3 | 64.2 | 65.5 | 66.6 |
| P. | 58.1 | 57.4 | 57.2 | 57.5 | 58.2 | 59.4 | 60.3 | 61.3 | 62.6 | 63.8 | 65.2 | 66.4 | 67.6 | 69.1 | 70.5 |

Repeatability Estimates:

| | |
|---|---|
| Contemporary | .36 |
| Non-contemporary | .42 |

Heritability Estimates:

| | |
|---|---|
| Offspring on Mid-Parent | .33 |
| Offspring on Dam | .82 |
| Offspring on Dam - pooled within sire | .77 |
| Offspring on Sire | .24 |
| Paternal Half-sib from AOV | .54 |

# Utilization of Feed by Beef Calves from 90 to 370 Days of Age.

by
W. W. Green

The results to be reported represent a segment of an over-all project dealing with the effects of early weaning on the duration of maternal influences of beef calves. The primary purpose of the present work was to study the relationships among (1) energy intake (TDN), F, (2) average weight, w, and (3) gain, g, of calves during successive 28-day feeding periods.

Angus calves were weaned at 90 days of age (30 heifers and 39 steers) or when 180 days old (27 heifers and 31 steers) and were individually fed free-choice until 370 days of age. The same ration was used during the six years of collecting data. Calves were fed three times per day and were weighed individually at approximately 11:00 A.M. at specific ages which were 28 days apart. Correlations and other statistics were calculated from the @residual@ line (within sex, year, and sire progeny group) of covariance analyses. Two equations were used: (1) equation (5) of Winchester and Hendricks (1953), $f = aw^b e^{kg}$, and (2) an ordinary multiple regression equation (A).

The major findings of the study were as follows: The growth of the calves weaned at 90 days of age (90 day calves) were essentially rectilinear, especially after 118 days of age. Both sexes averaged the same weight, 210 pounds, at 90 days but the steers were heavier on the average at 370 days, steers 665 and heifers 604 pounds. The gain per 28-day period was quite uniform for the 90 day calves after 174 days of age indicating that it might be possible to wean calves at 90 days of age and test their gaining ability rather reliably with an 8 to 12 week test period after the calves were 174 to 180 days of age. The growth pattern of the calves weaned at 180 days of age was similar to that of the 90 day calves but the average gain during successive 28 day periods was less uniform.

The average number of pounds of TDN consumed per period incrased at a slower rate than did average weight indicating that the calves may have been becoming more efficient or some other change was taking place. The ratio of average pounds of TDN consumed per period to average weight per period was 0.57 at the period 118 to 146 days of age, 0.51 at 230 to 258 days of age and 0.45 at 342 to 370 days of age. The 180 day calves followed an identical pattern.

The ratio of pounds of TDN to pound gain increased as the calves grew older, and heavier. Graphs of the ratios of successive 28 day periods and of average weight per period indicated that the ratio increased at the same rate as gain in body weight after 174 days of age for the 90 day calves and 202 days of age for the 180 day calves.

Values of $R^2_{f.wg}$ were essentially the same for equations (5) and(A) and for each sex and weaning age group. The values of $R^2$ fluctuated around 0.5 indicating that about only one-half of the variance in TDN intake was associated with variation in average weight and gain. This, plus the results relative to ratios of pounds of TDN to pound gain indicate a possible fallacy of using the ratio as a measure of the efficiency of feed utilization.

Standard partial regression coefficients, b' or B, were found to remain reasonably constant in value after 174 days of age for the 90 day calves, indicating a more or less constant relationships between energy intake and energy requirements for growth and maintenance.

The value of b of equation (5) was found to increase rather steadily from 0.47 during the 90 to 118 days of age feeding period to 1.0 or a little over 1.0 during each of the four 28-day periods from 258 to 370 days of age. This raises a question concerning the validity of using $W^{.7}$ for estimating the requirements of maintenance of calves in these age (and weight) ranges.

## Reference

Winchester, C. F. and W. A. Hendricks (1953). Energy requirements of beef calves for maintenance and growth. U.S.D.A., Tech. Bul. 1071.

# THE INFLUENCE OF SHIFTING CONSUMER DEMAND ON SELECTION PROGRAMS AND CURRENT RESEARCH IN ANIMAL BREEDING

by
N. R. Gyles

Man first knew Jungle fowl of southeast Asia. It was domesticated for fighting purposes for sport and wager. This caused it to spread to the Mediterranean and Europe. Egg productive breeds were developed along the Mediterranean coast, while dual purpose and meat types seemed to originate in Europe, England and spread across to America. The course of consumer demand started with the fighting bird, then shifted to mediocre egg and meat types that were bred more for excellence in show ring qualities than for economic productivity.

The rediscovery of Mendels work and the newer knowledge of nutrition developed around the turn of the century, gave much impetus to scientific breeding of poultry to provide better quality foods. This brought about a strong de-emphasis of breeding exhibition type birds, and now the entire quest is for greater productivity of economic traits.

In the market egg phase of the industry, it was once sufficient to supply enough eggs of random quality. This is no longer acceptable. Eggs are graded for size, freedom from meat or blood spots, albumen quality, shell texture and shell color. The commercial egg breeder no longer can depend entirely on selection for higher quantity of egg production, but has to rely upon selection for several traits at a time in order to assure satisfactory quality. In the early attempts to improve numbers of eggs, mass selection proved inadequate and has been replaced by progeny testing and full-sib testing. The great success scored in developing hybrid conn from test crossing numerous inbred lines at the Connecticut Agricultural Experiment Station in 1917 gave much impetus to investigation of this same procedure in egg type birds. In 1942 commercial egg producing companies placed large numbers of hybrid pullets on the market. They are currently produced in large numbers, as also are pullets bred on an intra flock basis by the time proven methods of progeny testing and sib testing. More recently, experimental work relating blood antigen gene systems with economic traits has carried over into commercial application.

In the meat phase of the poultry industry, a more fluid situation in consumer demand pertains. In 1930, at the outset of the broiler industry, purebred Barred Rocks were sold as live birds and were hauled in trucks to the big cities. Long distance of haulage demanded a vigorous bird, and the housewife liked the barred plumage. Experimental tests showed a fortunate nicking between Barred Rock males mated to New Hampshire females, which maintained the barred plumage in this rugged crossbreed. This crossbred replaced the purebred Barred Rock. By 1940 the housewife became more conscious of carcass appearance, and poultry processing plants had been instituted to relieve her of the tedious work of dressing the birds. This was realized through improved techniques of machine design and refrigeration. Now the housewife could look more objectively at the carcass under the showcase that someone else had dressed. Immediately she saw the dark pin feathers. The processor demanded from the breeder a bird without these pin feathers, and the hatcherymen wanted a bird with continued high hatchability, and the grower wanted continued fast growth rate. At that time,

breeders were extracting the New Hampshire strain from Rhode Island Reds and these provided the temporary answer. It was not long, however, before the housewife realized that these New Hampshires did not have sufficient fleshing on the breast to provide an attractive carcass. The processor protested to the breeder, whereupon the breeder turned to birds with naturally generous fleshing on the breast, these were the Cornish breed. They were unsuitable as a purebreed because of too low hatchability and insufficient eggs for the flock owner to make a living supplying a hatchery. Therefore, breeders turned to crossbreeding, using a Red Cornish male mated to New Hampshire females. These were beautiful birds, a grand improvement with rapid growth rate and outstanding fleshing.

Nevertheless, the persistent housewife complained again. She did not like the red pin feathers. Processors realized that a white plumaged bird dresses more easily and gives a much more attractive carcass than a bird with colored plumage. Breeders were under pressure to produce a white plumaged crossbred broiler of the same general quality as the red plumaged broilers produced from a Red Cornish X New Hampshire mating. Breeders knew the answer. It was to transfer the color inhibitor (I) gene and silver (S) gene from other breeds to the Red Cornish type male. This was time consuming and took about five years. In the meantime, the breeders of readily available white plumed birds, such as White Rocks, which had satisfactory growth and fleshing filled the gap temporarily to great advantage. Currently, the White Cornish type male has been developed and is now being used to produce most of the broilers by mating to White Rock females. This constant change in consumer demand keeps the situation in breeding meat type birds highly fluid. The breeder who looks to the future has to keep a reservoir of germ plasm in order to permit rapid shifts in direction and type of birds used in order to be current with the consumer demand, so as to have a saleable product of high quality.

With the shorter generation interval in poultry, maybe the beef cattle breeder can profit from some of the mistakes made by the more fast moving poultry breeding industry. These may be listed:

1. Failure to anticipate changes in market trends, and to take the necessary steps to guide their selection programs to meet the changing consumer quality demand.

2. Failure to realize the difference in heritability between traits, and persistence in applying methods suitable for egg production to breeding for meat production.

3. Continuance in selecting for a specific body type rather than superiority in economic traits over pen mates.

4. Ignoring the value of egg production combined with high hatchability for low chick cost.

5. Antagonistic attitude towards crossbreeding without evaluating its merit by actual tests.

In closing, it becomes evident that in any animal breeding industry geared to provide a quality market product, the breeder has to be ever vigilant and receptive to the shifting trends in consumer demand. Failure to recognize this and to respond with suitable modifications in selection programs and current research may cause a lage in general quality, or render the stock held by an individual breeder relatively unacceptable.

# Gain and Efficiency of Beef Calves on Different Levels of Feeding

by
H. J. Smith, C. M. Kincaid and C. S. Hobbs

Trios of half-sibs have been fed at the Tennessee Station since 1950 to investigate the effects of three different levels of feeding on growth, development and productivity in beef cattle. In these studies trios have been selected so that the three calves were of the same breed and sex, of similar type and conformation, as close as possible in weight and age and all by the same sire. Insofar as possible, they were selected from cows of similar type, age, weight, breeding and past performance. Calves within trios were randomly allotted to the three following levels of feeding;

(1) NC + FF - Nurse cow plus a full feed of hay and concentrates.
(2) FF - Full feed of hay and concentrates.
(3) R + LF - Roughage (pasture, hay or silage) plus limited concentrates during wintering periods.

The three members of a trio received their mother's milk up to weaning time (approximately 8 months) and in addition, the calf on the NC + FF level was allowed all of the milk it would take from a nurse cow both before and after weaning. The feeding test period extended from about 4½ months of age to 18 months. Calves on full feed levels were individually fed hay and concentrates free choice. Inidividual feed consumption records were obtained for calves on the R + LF level during wintering periods.

The purpose of this study was to determine the relative gain and efficiency of the calves during various periods of the feeding test and to investigate the effect of initial weight on test on feed consumption and feed efficiency. For this purpose, the feeding test of approximately 13½ months duration was divided into 3 periods of about 4½ months each. Periods 1, 2 and 3 were from 4½ - 9 months, 9-13½ months and 13½ to 18 months of age, respectively. Daily gain, daily feed consumption, feed efficiency and the hay:concentrate ratio were calculated for each period. The regression of total daily feed consumption on initial weight within periods and feeding levels was also determined. Only the data from the NC + FF and FF levels of feeding were amenable to the analysis since winter feeding periods for the R + LF level could not be compared with comparable periods in the other two levels.

The results are presented in Tables 1 and 2. In both the NC + FF and FF levels of feeding, there was a marked decrease in average daily gain from Period 1 to Period 3. The trend was essentially linear for both levels but more marked in the NC + FF level. At the same time, feed requirements per pound of gain showed a marked increase from Period 1 to Period 3 for both levels. In the NC + FF level, the average daily gains and total feed requirements per pound of gain for Periods 1, 2 and 3 were 2.18, 1.68 and 1.18 pounds and 3.4, 6.0 and 10.3 pounds, respectively. For the FF level, the daily gains and feed requirements for the various periods were 1.76, 1.46 and 1.10 pounds for daily gain and 5.3, 10.3 and 15.7 pounds for efficiency, respectively. Very efficient gains were obtained in Period 1 and these gains were about 3 times as efficient as compared with gains in Period 3. Differences in feed requirements between NC + FF and FF levels apparently reflect the feed replaced by milk from the nurse cow in the NC + FF level.

The regression of total daily feed consumption on initial weight within periods was very consistent for both levels of feeding (Table 2). The

average regression for all periods and feeding levels was .0224. This indicates that feed consumption increased about 2.2 pounds for each 100 pounds increase in initial weight within periods and feeding levels. When the feed efficiencies of individual calves were adjusted for differences in weight (to a standard weight) it was found that, in general, calves with larger initial weights were ranked lower on the basis of observed efficiencies than on adjusted efficiencies. The reverse was generally true for calves with lighter initial weights. This could have some significance in evaluating efficiency in groups of cattle fed on postweaning performance tests where there is considerable variation in initial weights.

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Table 1. Gain and Efficiency of Beef Calves on Different Levels of Feeding

| Level of feeding[a] | No. of days | Av. initial wt. (lbs.) | Av. final wt. (lbs.) | Av. daily gain (lbs.) | Av. daily feed cons. Hay (lbs.) | Conc. (lbs.) | Total (lbs.) | Feed per pound gain (lbs.) | Hay:conc. ratio |
|---|---|---|---|---|---|---|---|---|---|
| Birth to Period 1- | | | | | | | | | |
| NC + FF | 142 | 62 | 297 | 1.65 | -- | -- | -- | -- | -- |
| FF | 146 | 61 | 289 | 1.56 | -- | -- | -- | -- | -- |
| Period 1- | | | | | | | | | |
| NC + FF | 133 | 297 | 586 | 2.18 | 1.81 | 5.69 | 7.50 | 3.44 | 1:3.1 |
| FF | 133 | 289 | 522 | 1.76 | 2.16 | 7.18 | 9.34 | 5.31 | 1:3.3 |
| Period 2- | | | | | | | | | |
| NC + FF | 141 | 586 | 824 | 1.68 | 2.77 | 7.37 | 10.14 | 6.04 | 1:2.7 |
| FF | 143 | 522 | 730 | 1.46 | 3.51 | 11.55 | 15.06 | 10.32 | 1:3.3 |
| Period 3- | | | | | | | | | |
| NC + FF | 131 | 824 | 978 | 1.18 | 3.90 | 8.26 | 12.16 | 10.30 | 1:2.1 |
| FF | 128 | 730 | 871 | 1.10 | 4.27 | 12.99 | 17.26 | 15.69 | 1:3.0 |
| Periods 1,2 and 3- | | | | | | | | | |
| NC + FF | 405 | 297 | 978 | 1.68 | 2.84 | 7.11 | 9.95 | 5.92 | 1:2.5 |
| FF | 404 | 289 | 871 | 1.44 | 3.31 | 10.57 | 13.88 | 9.64 | 1:3.2 |

[a] NC + FF = Nurse cow plus a full feed of hay and concentrates.
FF = Full feed of hay and concentrates.

Fourteen calves individually fed within each level (1 bull, 1 steer and 12 heifers).

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Table 2. Regression of Daily Feed Consumption on Initial Weight within Feeding Levels and Periods

| Feeding level | Feeding period[b] | Initial weight (lbs.) | Av. daily feed consumption (lbs.) | Regression |
|---|---|---|---|---|
| NC + FF[a] | 1 | 297 | 7.59 | .0199 |
| | 2 | 586 | 10.14 | .0234 |
| | 3 | 824 | 12.16 | .0223 |
| FF[a] | 1 | 289 | 9.34 | .0223 |
| | 2 | 522 | 15.06 | .0231 |
| | 3 | 730 | 17.26 | .0219 |

[a] NC + FF = Nurse cow plus a full feed of hay and concentrates.
FF = Full feed of hay and concentrates.

[b] See Table 1.

Virginia Report, S-10 Technical Committee 1958

# HERITABILITY OF FEED EFFICIENCY IN BEEF CATTLE THAT ARE FULL FED

J. A. Gaines, R. C. Carter, C. M. Kincaid

The objectives of this study were (1) to estimate the effects of initial weight, years, total gain, and breed on feed efficiency of bulls and steers that were full fed, (2) to correct the data for these effects, and (3) to estimate heritability of feed efficiency.

The index of feed efficiency used was the number of pounds of TDN required per hundredweight gain.

The Virginia station has ten years' data on individual feeding of bulls and six years' data on individual feeding of steers. For this study data on 276 bulls and 152 steers were used. Additional data will be incorporated later, and further analyses will be made before this study matures into a journal article. The bulls were fed at the Beef Cattle Research Station, Front Royal, Virginia, in cooperation with the A.R.S., U.S.D.A., and the steers were fed in Blacksburg by the Virginia Agriculture Experiment Station. The authors felt there was not sufficient basis for pooling the bulls and steers; therefore, two separate analyses were made.

The bulls were individually full fed a ration of mixed hay and grain for a feeding period averaging 168 days. The hay and grain were fed separately, free choice, the first three seasons. Individual bulls were observed to differ widely in the relative proportions of hay and grain consumed. Beginning in 1951-52 the ration was changed to a mixture of 60% concentrates and 40% ground hay to insure each animal getting the same proportion of concentrates.

The steers were individually full fed a ration of mixed hay and grain for a feeding period averaging 200 days. The hay and grain were fed separately, free choice, the first two years. Beginning in 1951-52 the hay was ground and mixed with the concentrates.

Table 1 shows the regression analyses that estimate the least squares linear relationship of the feed efficiency (dependent) variable on the independent variables initial weight, year, total gain, and breed. The large $R^2$ values indicate that most of the variation in feed efficiency is linearly associated with initial weight and gain.

Table 2 contains the least squares estimates of the effects named above and their standard errors. The estimates show clearly that the lighter animals require significantly less TDN/cwt. gain than the ones that make the smaller gains.

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F. S. McClaugherty, Va. Agri. Exper. Sta., Glade Spring, Va.

Table 3 has in it the variance component analyses and the estimates of heritability of feed efficiency. The authors conclude that there is a reasonably high heritability of feed efficiency in full fed beef cattle. However, they intend to estimate the genetic correlation between feed efficiency and gain. This will lead to a conclusion as to whether we can expect to make satisfactory progress in improving feed efficiency by selecting on the basis of gain.

Table 1a

Steers: Regression Analysis

| Source | d.f. | Sum of Sq. | M.S. | F. | $R^2$ |
|---|---|---|---|---|---|
| Total | 151 | 1040093.9 | | | .76 |
| Regression | 25 | 795134.1 | 31805.4 | 16.4** | |
| Residual | 126 | 244959.8 | 1944.1 | | |

Table 1b

Bulls: Regression Analysis

| Source | d.f. | Sum of Sq. | M.S. | F. | $R^2$ |
|---|---|---|---|---|---|
| Total | 275 | 928263.1 | | | .67 |
| Regression | 29 | 619722.1 | 21369.7 | 17.0** | |
| Residual | 246 | 308541.0 | 1254.2 | | |

Table 2

Lease Squares Estimates & Standard Errors

| | Group | Steers | Bulls |
|---|---|---|---|
| INITIAL WEIGHT | 320-349 | -76 ± 18 | -61 ± 14 |
| | 350-379 | -44 ± 15 | -46 ± 11 |
| | 380-409 | -20 ± 15 | -32 ± 11 |
| | 410-439 | - 2 ± 13 | -13 ± 8 |
| | 440-469 | 0 | 0 |
| | 470-499 | 36 ± 13 | 12 ± 7 |
| | 500-529 | 38 ± 15 | 16 ± 8 |
| | 530-559 | 53 ± 17 | 43 ± 9 |
| | 560-589 | 66 ± 22 | 56 ± 10 |
| | 590-619 | 49 ± 35 | 73 ± 10 |
| | 620-649 | 145 ± 36 | 97 ± 16 |
| | Years not shown | | |
| TOTAL GAIN | 219-249 | 148 ± 26 | 128 ± 15 |
| | 250-280 | 147 ± 26 | 60 ± 14 |
| | 281-311 | 66 ± 35 | 37 ± 9 |
| | 312-342 | 74 ± 14 | 10 ± 10 |
| | 343-373 | 25 ± 14 | 0 |
| | 374-404 | 0 | -32 ± 7 |
| | 405-435 | -31 ± 12 | -43 ± 8 |
| | 436-466 | -81 ± 14 | -58 ± 10 |
| | 467-497 | -83 ± 17 | -68 ± 11 |
| BREED | Angus | 69 ± 11 | 0 |
| | Hereford | 0 | -27 ± 6 |
| | Shorthorn | 79 ± 18 | 18 ± 6 |

Avg. TDN/cwt. gain

Table 3a

Steers: Analysis and Estimates of Variance

| Source | d.f. | Sum of Sq. | M.S. | M.S. is est. of | Variance |
|---|---|---|---|---|---|
| Total | 151 | 292824 | | | |
| Sires | 35 | 91992 | 2628.3 | $\sigma^2 + k_o\sigma_s^2$ | 214.1 |
| Steers/Sires | 116 | 200832 | 1731.3 | $\sigma^2$ | 1731.3 |

$k_o = \frac{1}{35}\left(152 - \frac{804}{152}\right) = 4.19$; $\sigma_s^2 = \frac{2628.3 - 1731.3}{4.19} = 214.1$

$$\text{Heritability} = \frac{4\sigma_s^2}{\sigma_s^2 + \sigma^2} = \frac{856.4}{1945.4} = .44$$

Table 3b

Bulls: Analysis and Estimates of Variance

| Source | d.f. | Sum of Sq. | M.S. | M.S. is est. | Variance |
|---|---|---|---|---|---|
| Total | 275 | 375033 | | | |
| Sires | 68 | 150125 | 2207.7 | $\sigma^2 + k_o\sigma_s^2$ | 282.4 |
| Bulls/Sires | 207 | 224908 | 1086.5 | $\sigma^2$ | 1086.5 |

$k_o = \frac{1}{68}\left(276 - \frac{1916}{276}\right) = 3.97$; $\sigma_s^2 = \frac{2207.7 - 1086.5}{3.97} = 282.4$

$$\text{Heritability} = \frac{1129.6}{1368.9} = .83$$

# THE INFLUENCE OF BODY WEIGHT ON FEED INTAKE, DAILY GAIN AND EFFICIENCY OF YOUNG BULLS ON INDIVIDUAL FEEDING TESTS

by

C. M. Kincaid and E. H. Vernon

The data for this study was from individual feeding tests with young bulls at the Jeanerette, Louisiana station in the last three years (1955 to 1958). Each bull was kept continuously in an individual pen from weaning to the end of a 154-day test period with feed and water before him at all times. The feed was a mixture containing ground hay(approximately one-third of the total), corn, molasses and oil meal. At the start of the test the animals ranged in age from 180 to 290 days and averaged about 250 days. The 60 young bulls (20 each year) on test were from lines or breeds as follows:

37 Brahman-Angus
16 Afrikander-Angus
5 Brahman
1 Aberdeen Angus
1 Red Sindi

Average initial weight at the beginning of each period and daily gain and daily feed intake during each period is shown in Table 1. The periods were 28 days in length except $P_1$ in 1956 and 1957 and $P_6$ in 1958 which were 14 day periods. Since feed intake and gain was somewhat erratic and usually low in the first period ($P_1$) this period was not included in the analysis of variance and covariance of the three traits.

The analysis of variance (Table 2.A) showed a significant linear trend for both initial weight and daily feed intake with time but this was not the case for average daily gain. The error mean square (year x remainder) for average daily gain is rather large, but this would be expected with short periods. It appeared that differences in average daily gain among periods were random sampling errors with no indication of a pattern that tended to follow time, weight or feed intake.

The analysis of variance and covariance in Table 2B. indicates that initial weight at the beginning of each period accounts for a large fraction of the differences in total feed intake among animals within years.

The residual mean squares for animal-period interaction indicate rather consistent behavior within animal and period with regression coefficients (average daily feed intake on weight) similar to those obtained for animals within years, but the residual mean squares associated with these coefficients indicate sizeable differences in average feed intake among animals within years after adjustment for the influence of weight. On the average, weight accounted for 54 percent of the variance of feed intake among animals in 1956 and 1957, and 22 percent in 1958. Average daily feed intake within year increased by about 2 pounds for each 100 pound increase in liveweight.

[1] In each year the feeding test was started in October and ended in April. In the discussion the year referred to is the year in which the test ended.

The rank of animals on efficiency based only on feed intake and gain and their rank after adjusting feed intake to a constant body weight are shown in Tables 3 and 4 for 1957 and 1958, respectively. Adjustment to a constant body weight changed the rank of certain individuals markedly. For example, Sindi 525 in Table 3 ranked 5th on efficiency without adjustment and 17th after adjustment. In general, with adjustment to a constant weight those above average in weight tended to improve while the lighter weight animals tended to decrease in efficiency.

Comparisons between Brahman-Angus and Afrikander-Angus lines show the Brahman-Angus more efficient in both 1957 and 1958 when differences in weight were taken into account. Without adjustment there was a small difference in favor of Brahman-Angus in 1957 but almost no difference in 1958. Average daily feed intake was greater in both years for the Afrikander-Angus even though they were lighter in weight.

From these data it is suggested that efficiency may be more precisely measured from observations which provide estimates of ability to gain during the phase of growth when absolute gain under optimum conditions is essentially linear and ability to consume feed over standardized age and weight ranges. These data are in agreement with other observations which indicated that absolute growth rate in beef cattle under optimum conditions is essentially linear from up to about 15 months of age. Perhaps estimates of these traits (potential for growth and for feed intake) not necessarily taken during the same period of time would provide more precise estimates of real efficiency than the presently used system of obtaining both observations at exactly the same time. It is hoped that this possibility will be explored in existing data and in future investigations.

Table 1.

AVERAGES BY YEARS AND PERIODS FOR WEIGHT, DAILY FEED INTAKE AND DAILY GAIN OF ANIMALS FED INDIVIDUALLY.

| Weight | P1 | P2 | P3 | P4 | P5 | P6 |
|---|---|---|---|---|---|---|
| 1956 | 540 | 614 | 686 | 726 | 798 | 850 |
| 1957 | 519 | 555 | 600 | 670 | 725 | 788 |
| 1958 | 526 | 541 | 614 | 662 | 764 | 835 |
| Average | 528 | 570 | 633 | 686 | 762 | 824 |
| **Feed per day** | | | | | | |
| 1956 | 16.6 | 18.8 | 19.5 | 21.5 | 22.4 | 24.2 |
| 1957 | 13.0 | 15.8 | 19.8 | 18.3 | 19.1 | 19.3 |
| 1958 | 8.0 | 18.3 | 19.4 | 19.7 | 21.4 | 21.2 |
| Average | 12.6 | 17.6 | 19.6 | 19.8 | 20.9 | 21.6 |
| **Daily Gain** | | | | | | |
| 1956 | 2.57 | 2.41 | 1.58 | 2.54 | 2.04 | 3.30 |
| 1957 | 1.28 | 1.57 | 2.54 | 1.94 | 2.26 | 2.68 |
| 1958 | .51 | 2.57 | 2.44 | 2.90 | 2.50 | 2.70 |
| Average | 1.45 | 2.19 | 2.19 | 2.40 | 2.27 | 2.89 |

Table 2

WEIGHT AT THE BEGINNING OF EACH PERIOD, DAILY FEED INTAKE AND DAILY GAIN OF JEANERETTE BULL CALVES 1956-58

A ANALYSIS OF VARIANCE BY YEAR AND PERIOD

| Source of Variation | df | Mean Squares | | |
|---|---|---|---|---|
| | | Weight | Daily Feed | Daily Gain |
| Years | 2 | 1136 | 398.20 | 9.04 |
| Periods - Linear | 1 | 22484 | 433.09 | 9.32 |
| Remainder | 3 | 791 | 41.84 | 3.99 |
| Year x Linear | 2 | 124 | 38.56 | 1.74 |
| Year x Remainder | 6 | 34 | 14.75 | 4.47 |

B. ANALYSIS OF VARIANCE AND COVARIANCE WITHIN YEAR AND PERIOD

| Animals in Years | | SS(1) | S(1x2) | SS(2) | b(2/1) | b S(1x2) | Residual |
|---|---|---|---|---|---|---|---|
| Weight/(10 lbs) | | | | Feed per day (lbs) | | | M.S. |
| 1956 | 19 (df) | 7439. | 1416.2 | 495.51 | .1904 | 269.64 | 12.55 |
| 1957 | 19 (df) | 5080 | 1298.4 | 615.53 | .2556 | 331.87 | 15.76 |
| 1958 | 19 (df) | 3031 | 565.2 | 486.78 | .1865 | 105.41 | 21.19 |
| Total | 57 (df) | 15550 | 3279.8 | 1597.82 | .2109 | 691.71 | 16.18 |
| Animal-Period Interaction in Years | | | | | | | |
| 1957 | 76 (df) | 336 | 130.2 | 327.77 | .3875 | 50.45 | 3.70 |
| 1958 | 76 (df) | 259 | 56.7 | 237.56 | .2189 | 12.41 | 3.00 |
| Total | 152 (df) | 595 | 186.9 | 565.33 | .3141 | 58.71 | 3.35 |

Table 3. EFFICIENCY DATA ON BULL CALVES JEANERETTE 1956-57

| Sire | Animal | Weight | Feed per day | | Gain per day | Feed per cwt. gain | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Observed | Adjusted | | Observed | Rank | Adjusted | Rank |
| Bg 556 | 716 | 714 | 23.02 | 22.24 | 2.86 | 804 | 9 | 778 | 7 |
| Bg 567 | 681 | 762 | 21.48 | 19.59 | 2.84 | 756 | 6 | 690 | 2 |
| Bg 556 | 738 | 672 | 17.82 | 18.00 | 2.72 | 655 | 1 | 662 | 1 |
| Bg 431 | 731 | 690 | 18.64 | 18.41 | 2.64 | 706 | 3 | 697 | 3 |
| Bg 431 | 741 | 644 | 18.16 | 18.99 | 2.58 | 703 | 2 | 736 | 4 |
| Af 292 | 419 | 684 | 21.48 | 21.39 | 2.56 | 839 | 12 | 836 | 11 |
| Bg 622 | 723 | 692 | 19.58 | 19.30 | 2.54 | 771 | 8 | 760 | 5 |
| Ang 1 | 56 | 646 | 18.02 | 18.79 | 2.44 | 739 | 4 | 770 | 6 |
| Br 238 | 1056 | 660 | 18.46 | 18.92 | 2.40 | 769 | 7 | 788 | 8 |
| Bg 431 | 688 | 766 | 21.10 | 19.12 | 2.38 | 887 | 14 | 803 | 9 |
| Af 315 | 416 | 692 | 19.68 | 19.40 | 2.26 | 871 | 13 | 858 | 12 |
| Bg 622 | 679 | 678 | 17.26 | 17.31 | 2.12 | 814 | 10 | 817 | 10 |
| Bg 567 | 683 | 768 | 21.54 | 19.52 | 2.02 | 1066 | 17 | 966 | 16 |
| Bg 559 | 732 | 644 | 16.78 | 17.61 | 2.00 | 839 | 11 | 880 | 13 |
| Af 301 | 415 | 620 | 20.00 | 21.38 | 1.84 | 1087 | 18 | 1161 | 18 |
| Bg 621 | 686 | 672 | 16.74 | 16.92 | 1.84 | 910 | 16 | 920 | 14 |
| Bg 567 | 725 | 666 | 15.38 | 15.70 | 1.70 | 905 | 15 | 924 | 15 |
| Sindi | 525 | 414 | 12.80 | 18.92 | 1.70 | 753 | 5 | 1112 | 17 |
| Af 292 | 413 | 636 | 16.80 | 17.81 | 1.40 | 1200 | 19 | 1272 | 19 |
| Bg 518 | 724 | 664 | 14.82 | 15.19 | 1.14 | 1300 | 20 | 1332 | 20 |
| Averages all 20 | | 668 | 18.45 | 18.73 | 2.20 | 869 | | 888 | |
| Brah-Ang 13 | | 696 | 18.64 | | 2.26 | 846 | | 844 | |
| Afrik-Ang 4 | | 651 | 19.36 | | 2.02 | 999 | | 1032 | |

Table 4. EFFICIENCY DATA ON BULL CALVES JEANERETTE 1957-58

| Sire | Animal | Weight | Feed per day | | Gain per day | Feed per cwt. gain | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Observed | Adjusted | | Observed | Rank | Adjusted | Rank |
| Bg 441 | 761 | 640 | 20.82 | 21.74 | 3.12 | 667 | 2 | 697 | 3 |
| AF 324 | 461 | 690 | 22.64 | 22.41 | 3.10 | 730 | 6 | 723 | 5 |
| Bg 601 | 749 | 724 | 20.00 | 18.99 | 3.08 | 649 | 1 | 617 | 2 |
| Bg 620 | 759 | 778 | 24.50 | 22.25 | 3.04 | 696 | 3 | 582 | 1 |
| Bg 601 | 785 | 832 | 21.18 | 17.68 | 3.04 | 806 | 14 | 732 | 6 |
| Af 315 | 474 | 652 | 21.28 | 21.92 | 2.98 | 714 | 4 | 736 | 7 |
| Bg 635 | 776 | 678 | 21.24 | 20.45 | 2.90 | 732 | 7 | 705 | 4 |
| Af 324 | 460 | 666 | 20.66 | 20.98 | 2.74 | 754 | 9 | 766 | 11 |
| Af 324 | 453 | 668 | 20.68 | 20.96 | 2.68 | 772 | 12 | 782 | 13 |
| Af 364 | 470 | 652 | 21.76 | 22.40 | 2.62 | 831 | 17 | 855 | 18 |
| Bg 648 | 756 | 784 | 21.98 | 19.59 | 2.62 | 838 | 18 | 748 | 8 |
| Br 19G | 1157 | 638 | 19.70 | 20.67 | 2.60 | 758 | 11 | 795 | 14 |
| Br 19G | 1117 | 658 | 19.24 | 19.75 | 2.54 | 757 | 10 | 778 | 12 |
| Bg 620 | 775 | 722 | 21.24 | 20.27 | 2.42 | 876 | 19 | 830 | 17 |
| Af 315 | 452 | 610 | 19.20 | 20.81 | 2.36 | 813 | 15 | 882 | 19 |
| Bg 601 | 772 | 644 | 16.78 | 17.61 | 2.32 | 723 | 5 | 759 | 10 |
| Bg 601 | 770 | 660 | 16.54 | 17.00 | 2.26 | 732 | 7 | 759 | 9 |
| Bg 620 | 746 | 684 | 17.60 | 17.51 | 2.20 | 800 | 13 | 796 | 15 |
| Af 292 | 457 | 650 | 18.06 | 18.75 | 1.98 | 912 | 20 | 947 | 20 |
| Bg 635 | 776 | 678 | 15.28 | 15.32 | 1.84 | 830 | 16 | 833 | 16 |
| Averages all 20 | | 687 | 20.02 | | 2.62 | 770 | | 766 | |
| Brah-Ang 11 | | 715 | 19.74 | | 2.62 | 759 | | 732 | |
| Afrik-Ang 7 | | 655 | 20.61 | | 2.64 | 758 | | 786 | |

# EFFICIENCY OF FEED UTILIZATION FOR GROWTH AND FATTENING OF BEEF CATTLE
## (Report of some of the Feed Economy Studies in NC-1)*

Keith E. Gregory

Of primary consideration in any breeding research project is the determination of traits of economic importance; assessing their relative importance, and the development of suitable methods of measurement of them. This can be, and usually is, done concurrently with the obtaining of genetic parameter estimates, the major ones being inbreeding effects, heterosis effects, heritabilities, genetic correlations and genetic-environmental interactions. These genetic parameter estimates are essential for designing efficient and effective experiments for obtaining comparative data on the effectiveness of different systems of breeding, methods of selection and breeding procedures. Obtaining comparative data on systems of breeding, methods of selection and breeding procedures should be the long term objectives of our beef cattle breeding research if we are to fulfill our obligations to the industry by providing it with the information necessary for making maximum improvement in productive efficiency and quality of product.

Efficiency of feed conversion is one of the more important traits of beef cattle contributing to improved productive efficiency. Its importance thus established, we are interested in developing suitable methods of measuring it, and obtaining reliable estimates of its parameters. Traits may be measured either directly or indirectly, i.e. estimated through their association with other traits. The measurement of the trait itself is usually more desirable than estimating it through an indicator; however, in mass selection there are some traits that must be estimated through an indicator, such as selecting for the conformation items that contribute to carcass desirability and for the conformation items (whatever they are) that contribute to longevity. It is hoped that feed efficiency can be reasonably accurately estimated through indicators. Measuring economy of gain directly necessitates the obtaining of individual feed consumption data and the making of appropriate adjustments for differences in weight, as weight does have a significant influence on the feed required per unit of gain. This is a relatively expensive procedure, and for this reason we would like to develop suitable procedures for estimating it from its association with other traits. The association between feed efficiency and rate of gain has been one that we have been primarily interested in estimating. Its association with reduced feed requirements is the most important aspect of rate of gain; however, rate of gain per se is of importance because certain fixed costs such as labor, space, veterinary, etc. tend to be on a per head basis. However, its association with economy of feed use seems to be of greater importance.

Considerable individual feeding has been done in NC-1. We now have individual feeding data on approximately 2500 animals from approximately 275 sire groups. These data are from several stations over a period of about ten years, with three breeds and several lines involved, so that the effective degrees of freedom are not this great, but this does represent a considerable volume of data. The stations now feeding individually are Iowa, Kansas, Michigan, Missouri, Oklahoma, South Dakota and Wisconsin. Most of these stations are feeding bulls only and in the mair they are unselected. The length of feeding period varies from 154 to 196 days. Miciigan is also individually feeding four sire groups of steers each year. Individual feeding

* Data reported were analyzed by personnel from the Michigan, Kansas, Oklahoma, and South Dakota Stations.

was discontinued at Nebraska (both at Ft. Robinson and Lincoln) two years ago, but it is possible that it will be started again. This will probably be with steers so that the energy aspects of conversion can be studied more completely.

When Dr. Kincaid asked me to present some of the results from NC-1 on this subject I informed him that even though we do have a considerable volume of data on individual feeding that only a relatively small portion of it has been analyzed and that the results of these analyses have been given in either our Annual Reports or the Proceedings of our Technical Committee Meetings. Dr. Kincaid thought that it would be desirable to summarize these NC-1 results so they will be reviewed briefly here and you are referred to the Proceedings of the 1956 and 1957 NC-1 Technical Committee Meetings and the 1956 and 1957 Annual Reports of NC-1 for more detail. We hope to put increased emphasis on analyses of our feed efficiency data in NC-1 and I am sure that you will be interested in these results.

At the Michigan Station the relationship between T.D.N. required/100 lbs. gain and initial weight was the same for both bulls and steers; for both the regression coefficients was .6. Also, the Michigan Station with 19 sire groups of bull calves with four bulls per sire, on a within breed-year-group basis the R between T.D.N. required per 100 lbs. gain and rate of gain, initial weight and age was .86. The R for the same items was .7 for six sire groups of steers with 4/per sire group calculated on the same basis.

In analyses of data from the Kansas Station on 70 heifers, 30 bulls and 33 steers on a within sex-line-year basis initial weight, inbreeding and rate of gain jointly accounted for 25, 39 and 28 percent of the variation in feed efficiency in the heifers, bulls and steers, respectively. Inbreeding accounted for essentially none of the variation and initial weight and average daily gain were approximately equal in their influence.

At the Oklahoma Station analysis of data on 74 bull calves fed in two seasons the correlation (r) between rate of gain and feed required/100 lbs. of gain was -.78 in one season and -.83 in the other after adjusting for differences in average test weight.

In analysis of data on 138 bull calves from 21 sires from the South Dakota Station the following correlations were obtained.

Phenotypic and Genetic Correlations of Rate of Gain with Character Listed:

| | Eo* | $E_1$* | $E_2$* |
|---|---|---|---|
| Phenotypic | -.21 | -.54 | -.28 |
| Genetic | -.49 | -.536 | -.51 |

*Eo = observed (uncorrected efficiency)

*$E_1$ = Efficiency corrected for initial weight

*$E_2$ = Efficiency corrected for initial weight for age.

Even though these data are somewhat limited it seems that there is reasonably good agreement between the different studies. These results also seem to agree reasonably well with those reported in the literature on this subject. These data point out the necessity for adjusting feed economy for differences in weight when interpreting individual feeding data. It certainly is too early to say, but it appears reasonably hopeful that efficiency of gain can be estimated reasonably accurately from precise measures of gain. It is possible that other traits that are fairly easily measured may also be of some value in predicting or estimating efficiency of gain as we now define it. It seems that this possibility should not be ignored and that perhaps other measures of efficiency should be considered.

Some of you will recall a report by Dr. L. N. Hazel presented at a joint meeting of S-10 and NC-1 in 1952 at the Oklahoma Station, where his calculations indicated that little is to be gained by adding feed efficiency to a selection index for beef cattle if the genetic correlation between rate and efficiency of gain is as high as -.5. This is not to imply that this genetic correlation is that high but it seems that we are obligated to determine as soon as possible the most appropriate methods of measuring or estimating feed efficiency (either directly or indirectly) and to obtain reliable estimates of its genetic parameters.

# SUMMARY AND DISCUSSION ON MEASUREMENT OF EFFICIENCY IN BEEF CATTLE

by

E. J. Warwick

Efficiency of the beef cattle industry needs to be improved. I recently had occasion, when writing a history of the past fifty years of beef cattle breeding for the forthcoming anniversary issue of the Journal of Animal Science, to attempt to evaluate changes in efficiency which have taken place in the industry in the past fifty years. Economic statistics indicate an approximate increase of 15% in amount of beef produced per unit of feed consumed during the past five years as compared to a corresponding period about fifty years ago. It is uncertain how much, if any, of this may have been due to genetic changes in the cattle themselves and how much to differences and improvements in management procedures. The fact that apparent efficiency was as high during the depression years of the 1930's as it has been during recent years leads one to believe that genetic changes may not have been of much import. In an attempt to get at the question from another angle, we attempted to summarize the results of feeding experiments in which animals were fed standard or check rations. Differences in initial weights of cattle and in length of feeding period make it difficult to draw definite conclusions but it appears that cattle used in feeding experiments forty or fifty years ago made approximately as efficient gains as those used in similar experiments during the past ten or fifteen years. On the assumption that experiment stations used a more or less random sample of the better feeder cattle available in both periods, this would make it appear that there has been no essential change in the efficiency of the cattle, themselves, during this period.

We all know that if we look at the situation on a TDN basis the beef cattle industry is by far the least efficient class of domestic livestock when it comes to producing human food. The young calves may be more or less equivalent to the pig or chick in efficiency but efficiency drops off rapidly as they become older. Of course, we have no need to emphasize to a group such as this that the type of feed consumed by beef animals is vastly different from that consumed by these supposedly more efficient classes of livestock.

As I grasp the situation, efficiency or perhaps I should say apparent efficiency in other industries, has progressed through three procedures. First, obtaining faster gains; second, slaughtering at lighter weights; and third, producing a product with less fat.

Beef cattle are in a somewhat different situation than other industries in that so long as cows just have one calf per year, we have a tremendous overhead per calf at the time they are weaned. Even under the most favorable conditions, this probably amounts to approximately seven pounds of TDN per pound of weight at weaning. Also, there is a demand for at least a reasonable or potimum amount of fat in the product which we produce.

What are the possible avenues for increasing efficiency in beef cattle? The first and most obvious method is to increase reproductive efficiency. Increasing the nation's calf crop from its present approximate 80% to a figure approaching 100% would do more than any other one thing we are likely to accomplish to increase efficiency of the industry. A second thing, which will increase overall efficiency is improvement in weaning weights. This is an area where it appears that many present day beef cattle are deficient and where our research indicates that there is definite opportunity for bringing about improvement. On the other hand, we must know more about feed consumption of cows raising heavier calves and how much absolute increase in efficiency we accomplish through weaning heavier calves. All of us have been more or less guilty of assuming that a cow eats about a certain amount of feed regardless of how heavy the calf she weans may be. This is a generalization which may or may not be true and one that bears research. Neither do we know how much feed the calf itself consumes before weaning nor how it varies with the weaning weight. A third way of increasing efficiency is through producing animals which will make more efficient postweaning gains.

This is what we have been considering in this meeting. Early reports from both Beltsville and Miles City indicated that there was a rather high relationship between rate of gain and pounds of liveweight increase per unit of feed consumed. Subsequent research, much of it reported on here in this meeting, has confirmed and extended these early generalizations. It appears fairly definite that rate of gain accounts for somewhere in the range of 60 to 80% and probably 70 to 80% of the differences in feed consumed per unit of liveweight increase. This relationship is certainly large enough that it is very useful in both research and industry.

It appears to me, however, that there is a distinct possibility that if we breed for efficiency entirely indirectly through breeding for faster gaining cattle, we will more or less inevitably breed cattle which are larger at maturity. In making this statement, I know that many of you, as well as research workers in other regions, feel there is a possibility of breeding cattle with a genetic predisposition to make large gains early in life and then level off with only medium mature size being attained. This is certainly a desirable objective but I have yet to see critical evidence which will lead me to believe that probability of accomplishing it is very high. Certainly the Colorado work on the compress condition in Herefords points in the other direction. In any event, I believe that fundamental work to ascertain whether or not this is possible is certainly in order. If we are to attain increased efficiency only through breeding for increased rate of gain and if this inevitably leads to increased mature sizes there may be very definite limits beyond which we cannot go.

On the other hand, I wonder whether rate and efficiency of gain are highly enough correlated that we should depend entirely on rate of gain as a means of increasing efficiency. What about the other 20 to 30% of the variation in efficiency which can not be accounted for by rate of gain? What does this depend upon? Is it merely error in measurement? Does it depend upon differences in the rumen? Does it depend upon differences in digestive efficiency in the rest of the digestive tract? Dr. Brown has presented evidence at this meeting indicating that there is a possibility of there being hereditary differences in the ability of beef

animals to digest feed. I think it is in order to point out that there is also evidence on the other side of the question. For instance, Dr. Putnam of our staff at Beltsville ran rather complete digestive trials on four sets of identical twins last fall and found virtually no indications of between-set differences in ability to digest feed. These twin sets coming from many different herds presumably would tend to exhibit differences in ability to digest feeds if hereditary differences did in fact exist. Another question concerns how environment may influence efficiency in beef animals. Two experiments, one with mice in Scotland and the other with pigs at the Washington Agricultural Experiment Station have involved selecting animals for increased gains under conditions of full feeding and also under conditions of limited feeding in which about a 70% level of feed was offered. With both species, apparent genetic progress and rate of gain was made under both regimes. Subsequent performance, however, when animals produced from several generations of selection under one regime were transferred to the other, suggest strongly the improvement in rate of gain on a high plane of nutrition was accomplished primarily through increasing appetite. High plane animals, transferred to the limited plane of nutrition, performed very little if at all better than the foundation animals. On the other hand, it appeared that selection on the low plane of nutrition had been primarily for efficiency of feed utilization and animals selected on this plane exhibited superior performance when transferred to the high plane. It would appear to me that work of this kind poses some very definite problems so far as beef cattle are concerned.

In conclusion, I would like to say that in my opinion the problem of breeding for efficiency in beef cattle is of paramount importance and that it is one where a lot of brain power needs to be expended in order to develop new approaches to the problem.

# NATIONAL STATUS OF PERFORMANCE TESTING FOR BEEF CATTLE AS PART OF THE EXTENSION SERVICE PROGRAM

by

C. E. Bell, Extension Animal Husbandman, Federal Extension Service

In discussing this subject, Mr. Bell indicated that the rapid growth of performance testing across the country had led to some confusion regarding terminology. He suggested that programs for the measurement of performance in beef cattle should be referred to as "Beef Cattle Improvement" programs because this was in effect what they were. He emphasized that performance testing was another tool which had been developed for breeders to use in beef cattle improvement and that research would continue to add tools to the breeder's kit.

The meeting in Chicago last fall included research and extension personnel as well as breed representatives and helped very much to bring about more uniformity with respect to terminology and general agreement regarding standard terms in expressing gain and score. At a recent joint meeting of extension and research personnel in the Western region, it was agreed for that region to express growth as average daily gain and score or grade, as fancy, choice, good, medium, etc., with numerical values which started with 17 for high-fancy and decreased by one point for each decrease of 1/3 of a grade. This numerical system for grade or score is similar to the one approved by the S-10 Technical Committee in 1952.

According to his records, 36 states and the Territory of Hawaii had some phase of performance testing underway. Formal associations had been organized in eight states with most of these called Beef Cattle Improvement Associations. The indications were that several other states would organize associations within the next year. According to his records, there were 1443 herds in testing programs with the number increasing steadily. This did not include many breeders following a program of their own.

The big problem in most states was finding manpower to get the job done. It was his opinion that the movement would continue to grow and lead to more rapid improvement of beef cattle. He pointed out that the job of the Extension Service was one of getting programs organized and started on a sound basis so each could be turned over to breeder organizations when it was on its way. It was his hope that enough uniformity in terminology and methods of measurement would be achieved to bring about standard measures that mean the same thing in all parts of the country.

PERFORMANCE TESTING FIGURES

| | No. Herds | Remarks | Associations |
|---|---|---|---|
| Alabama | 30 | | |
| Arizona | 20 | | |
| Arkansas | 18 | | |
| California | 37 | | Will organize in July |
| Colorado | 28 | | |
| Connecticut | -- | | |
| Delaware | -- | | |
| Florida | 25 | | Expect to organize this year |
| Georgia | 9 | | |
| Idaho | 5 | | |
| Illinois | 79 | (2925 cows) | |
| Indiana | 12 | | |
| Iowa | -- | | |
| Kansas | 5 | | |
| Kentucky | -- | | |
| Louisiana | -- | Will start this year | |
| Maine | 36 | | Expect to organize this year |
| Maryland | 21 | | Expect to organize this year |
| Massachusetts | -- | | |
| Michigan | -- | | |
| Minnesota | -- | Some interest | |
| Mississippi | 6 | | |
| Missouri | 34 | | |
| Montana | 45 | | Yes-organized in 1956. |
| Nebraska | 99 | | Expect to organize this year |
| Nevada | 4 | | |
| New Hampshire | -- | | |
| New Jersey | -- | Will start 5 demonstration herds this year | |
| New Mexico | 200 | | Yes-organized in 1956 |
| New York | 18 | | |
| North Carolina | 11 | | |
| North Dakota | 85 | | |
| Ohio | 10 | | Yes-organized in 1957 |
| Oklahoma | 88 | | Yes-organized in 1956 |
| Oregon | 30 | | Expect to organize this year. |
| Pennsylvania | 8 | | Yes-organized in 1958 |
| Rhode Island | -- | | |
| South Carolina | 11 | | |
| South Dakota | 42 | 3485 calves (190d) ave. wt. 394 | |
| | | | Yes-organized in 1956 |
| Tennessee | 22 | | |
| Texas | 181 | (151 in Pioneer Assn) | Yes-organized in 1956 |
| Utah | 10 | | |
| Vermont | -- | | |
| Virginia | 132 | | Yes-organized in 1955 |
| Washington | 80 | | |
| West Virginia | -- | | |
| Wisconsin | -- | Some interest | |
| Wyoming | 12 | | |
| Alaska | -- | | |
| Hawaii | 6 | | |
| Puerto Rico | -- | | |
| | 1,443 | | |

Alabama Station

Submitted by T. B. Patterson and G. B. Meadows

The beef cattle breeding research at the Alabama Station is conducted under project entitled "Improvement of Beef Cattle of Alabama Through Breeding Methods." e objectives are: (1) To determine the effectiveness of selection for total performance in beef cattle, (2) To develop criteria for evaluating and selecting eeding animals, and (3) To determine the influence of heterosis on rate of gain, rcass quality and cow performance.

Data collected include birth weight, 180-day weight, 250-day weight, 250-day nformation score and post weaning performance on all heifer calves and on selected .ls.

Correction factors for sex of calf and age of dam were calculated based on )-day weights of all calves produced since the project was initiated. These data e presented in Table I.

Table I

x of calf:

| | Angus | | Hereford | | Shorthorn | | All Breeds | |
|---|---|---|---|---|---|---|---|---|
| | No. | Wean Wt. | No. | Wean Wt. | No. | Wean Wt. | No. | Wean Wt. |
| .ls | 36 | 536 | 63 | 504 | 16 | 514 | 514 | 515.4 |
| ers | 26 | 508 | 31 | 434 | 7 | 478 | 64 | 468.9 |
| .fers | 68 | 465 | 89 | 434 | 32 | 407 | 190 | 440.5 |

e of Dam:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| rs. old | 7 | 466 | 13 | 410 | 10 | 446 | 30 | 435.1 |
| rs. old | 30 | 488 | 50 | 440 | 14 | 456 | 94 | 457.6 |
| rs. old | 22 | 476 | 43 | 456 | 11 | 456 | 76 | 462.0 |
| rs. old | 22 | 510 | 29 | 467 | 12 | 428 | 63 | 474.6 |
| rs. old | 19 | 497 | 27 | 460 | 8 | 449 | 54 | 471.4 |
| rs. old | 13 | 508 | 7 | 482 | -- | --- | 20 | 498.9 |
| rs. old | 5 | 502 | 2 | 518 | -- | --- | 7 | 506.6 |
| rs. old | 2 | 500 | 5 | 511 | -- | --- | 7 | 508.0 |
| rs. old | 2 | 488 | 5 | 570 | -- | --- | 7 | 548.0 |
| r older | 8 | 501 | 3 | 499 | -- | --- | 11 | 500.4 |

The birth of five Angus calves, four heifers and one bull, with under developed ndible has been noted over the past three years. These calves have been produced t of five different dams and by two different bulls. The two bulls are half others while four of the cows were sired by the same bull. The fifth cow is a daughr of one of the other known "carrier" cows. This character appears to be recessive d similar to parrot jaw reported in the literature dealing mostly with milking horthorn cattle.

Possible carrier cows have been identified and young herd bulls are being sted on these cows before being placed in the breeding herd.

The first calves from the crossbreeding phase are being weaned as they reach 250 days of age. Insufficient numbers make preliminary analysis meaningless at this time.

Selection of replacement heifers based on conformation score, weight per day of age, and post weaning test is being continued. At the same time poor producing cows are being culled.

The need for earlier culling decisions on bulls led to a study of the relationship between 180-day weights and 250-day weights. Table II gives the correlation between 180-day and 250-day weights and between gain from birth to 180 days and gain from 180 days to 250 days.

| | Angus | | Hereford | | Shorthorn | |
|---|---|---|---|---|---|---|
| | Bulls | Heifers | Bulls | Heifers | Bulls | Heife |
| No. of calves | 13 | 17 | 30 | 32 | 5 | 8 |
| 180-day-250-day wt. | 0.82 | 0.84 | 0.96 | 0.94 | 0.99 | 0.93 |
| Birth to 180-180 to 250 gm. | 0.25 | 0.46 | 0.63 | 0.45 | 0.93 | 0.67 |

Based on these results the first culling is now being made at 180 days. Data will still be taken at both 180 and 250 days.

# FLORIDA REPORT S-10 TECHNICAL COMMITTEE MEETING 1958

## Active S-10 Projects:

1. State Project Number 390. Breeding Beef Cattle for Adaptation to Florida.
   Location: Range Cattle Station, Ona, Florida.

2. State Project Number 629 (Cooperative with U.S.D.A.) Selection of Cattle for Beef Production in Southeastern United States.
   Location: West Central Florida Experiment Station, Brooksville, Florida.

3. State Project 752. Genetics of Dwarfism in Beef Cattle.
   Location: Main Station, Gainesville, Florida

## Other Breeding and Related Projects:

1. State Project Number 545. Breeding Beef Cattle for Adaptations to South Florida Conditions.
   Location: Everglades Experiment Station, Belle Glade, Florida.

   Proeedure: Production performance is being determined on the following groups of cattle on muck pastures at Belle Glade: Brahman, Devon, BxD $F_1$ criss-cross between Brahman and Devon, inter-se mating of B x D crossbreds, and purebred Angus. A limited amount of crossing between Angus and Brahman has also been done. This project is being revised to include selection and cross-breeding of Angus, Hereford and Brahman. The Brahman x Devon crossbreeding will be discontinued as data on various groups becomes adequate.

2. State Project Number 615. Influence of Breed Composition and Level of Nutrition on Adaptability of Cattle to Central Florida Conditions.
   Location: Range Cattle Station, Ona, Florida.

   Procedure: The relative productivity of cows with varying proportions of Brahman and Shorthorn breeding is being determined when cows are run on Native, partially improved, and highly improved pastures.

3. State Project 627. Pasture Programs and Breeding Systems for Beef Production of Flatwoods Soils of Central and North Central Florida.
   Location: Beef Research Unit, Gainesville, Florida.

   Procedure: Brahman-Native cows were mated to Brahman, Angus, Hereford and Shorthorn bulls during the first five years of this project. The female offspring are being used to test the following breeding systems: Upgrading to a British breed, criss-crossing bulls of two British breeds, criss-crossing of British and Brahman bulls, and criss-crossing of British and American breed bulls.

4. State Project 631, A Comparison of the Carcass Characteristics of Purebred Brahma, Purebred British Breeds and their Crosses.
   Location: Meats Laboratory, Gainesville with cooperation from Branch Stations.

   Procedure: Comparisons are being obtained as indicated in title. The work has been expanded to get carcass data on all experimental cattle which are slaughtered in order to obtain more data on genetic aspects of tenderness and carcass quality.

5. State Project 709. Improvement of Reproductive Efficiency in Beef Cattle.
Location: Main Station, Gainesville, with cooperation of Branch Stations.

Procedure: Influence of various factors on reproductive efficiency is being determined with the view of providing information which will be useful in improving reproductive efficiency.

6. State Project Number 717. Heritability of Performance Estimates in Angus, Brahman, and Hereford Cattle.
Location: Main Station, Gainesville.

7. State Project 809. The Effect of Hormones on the Physiology of Reproduction in British and Brahman Beef Cattle.
Location: Main Station, Gainesville.

Progress of Work:

1. Range Cattle Station (Project Number 390 and 615).

Personnel at the Range Cattle Station who are leaders on breeding projects include Dr. W. G. Kirk, F. M. Peacock and Dr. E. M. Hodges. Specialists at the Main Station who cooperate on breeding projects at Range Cattle Station are M. Koger, A. Z. Palmer, and A. C. Warnick.

All of the weaning and growth data which has accumulated at the Range Cattle Station since 1942 has been put on IBM cards. This data is now in the process of being analysed by a Ph.D. candidate and by F. M. Peacock of the Range Cattle Station. It is anticipated that a number of journal articles and bulletins will be published from this material within the next year.

The project on the influence of breed composition and level of nutrition is now yielding significant data. The results from this project for 1957 were included in the last S-10 Annual Report. The results continue to demonstrate a striking effect of heterosis on growth and suggest a significant breed group x level of nutrition interaction, with cattle heavy in Brahman breeding performing at near the same rate on all nutritional levels while other groups show a marked increase in production with improved nutrition.

Slaughter data from cattle produced by the Range Cattle Station are providing much of the information being accumulated on the genetic aspects of tenderness and carcass quality.

2. West Central Florida Experiment Station, Brooksville. (Project No. 629)

The project at Brooksville is cooperative between the U.S.D.A. and Florida Agricultural Experiment Station. Federal personnel on the project are W. C. Burns and C. M. Kincaid. State personnel are M. Koger, A. C. Warnick and A. Z. Palmer.

This year's calf crop will complete five years's data from this study. The information will be summarized for publication in bulletin or circular form this fall. Since the foundation herds were in process of establishment during this period, firm conclusions must await further results. The following generalizations, however, appear warranted at this time.

The Angus and Hereford groups have had inadequate milk production for satisfactory weaning weights of calves. Some calves were so retarded that postweaning development has been unsatisfactory on high roughage rations or grazing. Reproduction in the British breeds has been satisfactory, however, (approximately 85 percent weaned) and significant progress through culling and improved pastures has been made. Feed lot performance of steers from these herds has been satisfactory except for animals which were extremely substandard at weaning.

Weaning weights of Santa Gertrudis, Brangus and Brahman calves have been generally satisfactory, ranking by breed in descending order as mentioned. Reproductive efficiency, however, was low (approximately 65 percent) in these three groups during the first three years of the project and has continued thus in the Santa Gertrudis and Brahman. The Brangus herd has shown marked improvement in reproduction during the last two years following rather rigid culling on this factor. Pounds of calf weaned per cow bred has been very nearly the same for these three groups combined as for the Angus and Hereford combined. Feed lot performance of steers from the Brahman, Brangus and Santa Gertrudis groups has been generally unsatisfactory because of low carcass grade as compared to the British steers.

The project outline is in the process of revision. The program will be enlarged to test bulls produced in some of the foundation herds for general and specific combining ability when bred to cows of their own breed and to crossbred cows. If specific combining ability is indicated by a significant sire x breed of cow interaction, sons of high and low performing bulls will be tested to determine whether combining ability with crossbred cows will be transmitted from sire to son. Development of facilities and accumulation of cattle for this enlargement of the project are proceeding.

Supplementary studies on methods of wintering brood cows, development of young growing cattle and feed-lot studies also have been initiated and are yielding information useful to the area.

3. Everglades Station, Belle Glade. (Project No. 545).

Personnel at the Everglades Station are R. W. Kidder, H. L. Chapman and J. R. Crockett.

Data from the Everglades Station continue to demonstrate a dramatic heterosis response from crossing European and Brahman cattle. Crossbred calves have averaged from approximately 50 pounds to more than 100 pounds heavier at weaning than straight bred calves. Table 1 shows the production data for the various breeding groups for 1957. The differences are rather typical of results for the last 3 years except that some of the B x D crossbred groups had a higher than normal calf crop in '57 due to a lower calf crop in 1956. It will be noted that calves from the inter-se matings (mostly first generation) of crossbreds exhibit approximately only 50 percent of the advantage of the $F_1$ crosses. Criss-cross calves were intermediate between $F_1$ and inter-se calves.

Apparently, selection in the Angus herd for performance under South Florida conditions is proving to be highly effective. During the early years of this herd, production performance was very unsatisfactory.

Each year, hoever, the Angus herd has improved until for the last two years production per cow bred has compared favorably with the combined crossbred groups because of higher reproductive efficiency in the Angus.

The Everglades project is in the process of being revised to reduce the Brahman-Devon herds and utilize more popular beef breeds in selection and crossbreeding studies.

4. Main Station, Gainesville.

Personnel involved in breeding studies at the Main Station are M. Koger, Animal Geneticist, A. C. Warnick, Physiologist, A. Z. Palmer, meats, and J. F. Hentges, beef cattle production.

J. C. Dollahon, presently at Mississippi State College, completed a Ph.D. dissertation using data from the dwarfism project (No. 752). The summary from this thesis is attached. Three journal articles from this data have been submitted for publication. Further test matings were made this spring. The project is being continued as outlined.

The first phase of the project at the Beef Research Unit (No. 627) has been completed. A five year summary of the weaning data is shown in Table 2. A Station Bulletin from this data is in progress. The steer data from this project was summarized in a Masters Thesis. A summary of this material is shown in Table 3.

Work on the causes of low reproductive efficiency in Florida continues. Even though studies from other areas indicate that little improvement from selection for regular reproduction would be expected, selection in Florida populations appears to be effective. Progress in the Brangus herd at Brooksville was mentioned above. Conception rate at the Beef Research Unit was 32, 62, 71, 88 and 90 percent, respectively for the years 1953 through 1957. Our interpretation of this increase is that the major portion of it must have been due to selection rather than environmental factors.

The results of a survey of the reproductive efficiency being achieved on Florida ranches are being prepared for publication as a bulletin this fall. A partial summary is shown in Table 4.

Meats investigations at Florida include a study of the various factors influencing carcass desirability with particular emphasis on the genetic aspects of tenderness. Carcass studies are being made on all experimental cattle which are slaughtered. Results of a preliminary study on tenderness are summarized in Tables 5 and 6. Data in this area are being analyzed for a Ph.D. dissertation and publication.

Table 1. Summary of 1957 Weaning Data from Everglades Station.

| Breed | No. of Calves | Weaning Percent | Adj. Weaning Weight | Slaughter Grade |
|---|---|---|---|---|
| Angus | 26 | 81.3 | 376 | 9.5 |
| A x B Crossbreds | 12 | 66.7 | 494 | 10.6 |
| Brahman | 9 | 56.3 | 363 | 6.0 |
| Devon | 25 | 62.5 | 394 | 6.2 |
| B x D $F_1$ [1] | 8 | 61.5 | 461 | 8.1 |
| Calves from B x D $F_1$ | 7 | 87.5 | 464 | 8.4 |
| Criss-Cross B x D Crossbreds | 15 | 81.5 | 440 | 7.7 |
| Inter-se B x D Crossbreds | 40 | 71.4 | 422 | 7.2 |

[1] $F_1$ calves were from Devon cows.

Table 2. Effects of Various Factors on Weaning Performance of Calves from Beef Research Unit from 1953 through 1957

| Variables | Deviation from Mean | |
|---|---|---|
| | Weaning Weight[1] | Slaughter Grade[2] |
| | lbs. | S-10 Score |
| 1. Breed of Sire[3] | | |
| Angus | -5 | + .12 |
| Brahman | -15 | - .63 |
| Hereford | +16 | + .52 |
| Shorthorn | + 4 | - .01 |
| 2. Sex of Calf | | |
| Steer | + 8 | - .06 |
| Heifer | - 8 | + .06 |
| 3. Month of Birth | | |
| December | + 7 | + 1.18 |
| January | +11 | + .87 |
| February | - 1 | + .05 |
| March | - 7 | - .48 |
| April | -10 | - 1.63 |
| 4. Pasture Program | | |
| 1 | - 7 | - .10 |
| 2 | - 1 | - .09 |
| 3 | -16 | - .56 |
| 4 | +11 | + .04 |
| 5 | +19 | + .33 |
| 6 | - 7 | + .10 |
| 7 | - 3 | - .07 |
| 8 | + 4 | + .38 |

1 Mean weaning weight = 415.
2 Mean score = 9.4
3 Dams were all Brahman-Native cows.

Table 3. Summary of Steer Data from BRU 1953-1957

| | Breed of Sire | | | | Winter Program | |
|---|---|---|---|---|---|---|
| | Angus | Brahman | Here. | SH. | Low | Inter-mediate |
| D. gain, winter period | .34 | .19 | .28 | .35 | .05 | .51 |
| D. gain, on summer pasture | 1.9 | 2.3 | 2.5 | 2.3 | 2.4 | 2.1 |
| D. gain on feed | 1.7 | 1.9 | 2.3 | 2.1 | 2.2 | 2.2 |
| Av. carcass grade | 9.9 | 8.1 | 9.7 | 9.3 | 9.4 | 9.7 |
| Estimated net return per steer | $10.9 | 2.5 | 20.3 | 16.9 | 7.4 | 12.3 |

Table 4. Mean Conception Rate of Cows of Different Breeding and Different Ages on 9 Florida Ranches.

| Breeding and age of cows | Lactation Status | | | | Difference |
|---|---|---|---|---|---|
| | Wet | | Dry | | |
| | Number | Percent Preg. | Number | Percent Preg. | |
| British | | | | | |
| 1.2 years old | --- | --- | 653 | 74.3 | -------- |
| 2.3 years & up | 793 | 75.1 | 239 | 84.5 | 4.8 |
| Brahman and Brahman crossbreds | | | | | |
| 1.2 years old | --- | --- | 455 | 70.2 | -------- |
| 2.3 yrs & up | 1652 | 54.9 | 949 | 84.0 | 29.1 |

Table 5. Mean Square Errors of Estimate from Covariance Analysis of Age at Slaughter (x) and Tenderness Score (y).

| Source | df | Tenderness Mean Square |
|---|---|---|
| Total | 188 | .897 |
| Within Sires | 174 | .727 |
| Sires | 14 | 3.008 ** |
| Breed of Sires[1] | 2 | 12.460 ** |
| Sires within breed | 12 | 1.31 * |

[1] Mean tenderness score for breeds of sire:
Brahman, 3.5
Crossbred, 3.0
Shorthorn, 4.2

Table 6. Heritability Estimates for Tenderness Based on Intraclass Correlation of Half-Sibs.

| Sires Used in Estimate[1] | Heritability |
|---|---|
| | Percent |
| 1. All sires, disregarding breed | 129 |
| 2. Brahman sires | 51 |
| 3. Shorthorn sires | 0 |
| 4. Crossbred sires | 0 |

[1] Crossbred and Shorthorn bulls were mated to crossbred cows. Brahman bulls were mated to crossbred cows and a smaller number of Brahman cows.

Genetic, Anatomical and Physiological Aspects of Dwarfism in Cattle

by
J. C. Dollahon

Ph.D. Dissertation, University of Florida
June, 1958

## SUMMARY

A study was conducted on the anatomical, physiological and genetic aspects of different forms of dwarfism in cattle. Anatomical features of the dwarf animals obtained from the dwarf breeding herds maintained at the Beef Research Unit and from various sources throughout the states of Florida and Georgia were compared with those of normal controls. Physiological comparisons including a number of different traits were made between carriers of the snorter dwarf gene and assumed non-carrier animals which were maintained at the Purebred Beef Unit. Dwarf X dwarf matings were made within the dwarf breeding herds maintained at the Beef Research Unit.

The results from the anatomical portion of the study showed that internal hydrocephalus, beaded or compressed vertebrae and shortened long bones were the only anatomical abnormalities shown to be consistently associated with the snorter type dwarf. Hydrocephalus and beaded vertebrae were noted in several of the other dwarf types studied, but they were not consistently observed in combination in any dwarf type other than the snorter.

Physiological studies conducted on carrier and non-carriers of the snorter dwarf gene revealed that the mean corpuscular volume and the RNA content of the plasma protein were significantly higher in the carrier group. A highly significant difference between the DNA content of the plasma protein obtained from dwarf-carrier and assumed non-carrier animals was noted. Also, the cerebrospinal fluid pressure when measured at the atlas-axis junctura showed a highly significant difference between the carrier and non-carrier groups. In all cases there were varying degrees of over-lap between the response of the two groups which prevented differentiation of the carrier and non-carrier groups with an acceptable degree of accuracy.

The results from the genetic portion of this study showed:

1. The midget condition in Brahman cattle appears to be inherited as a recessive trait, although the possibility of an incompletely dominant condition has not been eliminated.

2. The offspring from a midget Brahman x snorter Hereford mating was a stillborn calf that resembled an extreme snorter type dwarf which indicates the gene or genes for the midget condition in Brahman cattle may be related in some way to dwarf genes observed in other breeds.

3. From a group of matings made in this study, it appears that the comprest, certain longheaded and snorter type dwarfs are genetically related. The exact genetic relationship of the three types was not determined.

4. It was shown that a small compact animal known as the guinea in heterogeneous crossbred and Florida native cattle is the heterozygote for a lethal achondroplastic "bulldog" gene suggesting that the guinea is a decendant of Dexter cattle which are known to have been introduced into Florida.

5. The introduction of the snorter gene into a Brahman-European-Native population, produced offspring which were more compact, lighter in weight and higher in slaughter grade than calves sired by normal non-carrier males. The weaning weights for the offspring sired by a snorter dwarf were significantly lighter (P = 0,05) than those of the non-carrier male. There was a highly significant difference (P = 0,01) between wither heights of the two groups.

6. When a midget Brahman bull was mated to Brahman-Europena-Native cows, the offspring produced were heavier at weaning and graded higher than the offspring sired by a normal bull when mated to comparable dams; however, these differences were not significant. These results are in agreement with the indications from inter-se matings of midgets that midgetism is a recessive trait.

Georgia Report, S-10 Technical Committee, 1958

The Georgia Coastal Plain Experiment Station

Beef cattle breeding studies are being conducted at Tifton and at the Georgia State Prison Farm at Reidsville. Projects at Reidsville are (1) A Study of Grading, Crisscrossing and Rotational Crossing as Breeding Systems for Commercial Beef Production and (2) Selection of Beef Cattle for Single Items of Importance in Profitable Beef Production. At Tifton, progeny testing studies are conducted with Polled Hereford and Angus cattle.

Progeny Testing Studies. The Polled Hereford herd of approximately 100 breeding females is divided into an A and B unit. The A unit contains around 20 females which were selected for superiority in respect to weaning weight, rate of gain and score. The best available progeny tested bull is mated to this group of females. The remaining or B unit females and Angus females are used in progeny testing young prospective sires selected from within the herds or for outcross sires.

A summary of weaning weights for both herds through 1957 is presented below.

| | Polled Herefords | | | | | | Angus | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | | | 210 day weights | | | Number | | | 210 day weights | | |
| | M | F | T | M | F | Ave. | M | F | T | M | F | Avg. |
| Avg.* | 234 | 257 | 491 | 450 | 411 | 430 | 68 | 60 | 128 | 467 | 419 | 444 |
| 1954 | 36 | 23 | 59 | 420 | 376 | 403 | 16 | 13 | 29 | 460 | 446 | 454 |
| 1955 | 33 | 33 | 66 | 438 | 381 | 410 | 13 | 15 | 28 | 485 | 415 | 448 |
| 1956 | 43 | 31 | 74 | 441 | 412 | 430 | 15 | 15 | 30 | 443 | 398 | 421 |
| 1957 | 28 | 37 | 65 | 383 | 370 | 375 | 15 | 18 | 33 | 443 | 370 | 403 |
| All years | 374 | 381 | 755 | 440 | 403 | 421 | 127 | 121 | 248 | 463 | 412 | 438 |

* Polled Herefords, 1936 through 1953. Angus, 1945 through 1953.

Since weaning weight in both herds tended to decrease somewhat, the decision was made to place more pressure on this character in the immediate future.

The 1957 calves were weaned at approximately seven months of age. All calves were fed for a 28-day preliminary period before being placed on the official 140-day test period. The calves were full-fed a completely mixed ration containing 60 parts ground snapped corn, 15 parts cottonseed meal and 25 parts ground Coastal Bermuda grass hay. Results of this feeding test for seven groups of bull calves were as follows:

| Breed | Sire | No fed | Test Weights Initial | Final | Avg. daily gain | Avg. age, days | Type Score | Rating |
|---|---|---|---|---|---|---|---|---|
| P. H. | 565 | 6 | 399 | 729 | 2.36 | 387 | 26.6 | 73.8 |
| P.H. | 543 | 7 | 453 | 795 | 2.44 | 401 | 30.8 | 79.7 |
| P.H. | 534 | 6 | 425 | 773 | 2.48 | 387 | 29.4 | 79.0 |
| P.H. | 513 | 5 | 385 | 736 | 2.50 | 384 | 27.4 | 77.4 |
| P.H. | 562 | 3 | 356 | 673 | 2.26 | 366 | 30.3 | 75.7 |
| Angus | 136 | 7 | 464 | 788 | 2.32 | 389 | 31.1 | 77.5 |
| Angus | 103 | 6 | 484 | 833 | 2.49 | 383 | 33.0 | 82.8 |

Daily gains for calves ranged from 1.00 for one calf which for some unknown reason did not perform well to 3.3 pounds. The above type score is the result of converting S-10 scores to a basis of 50 points. The rating was calculated by dividing daily gain by the factor .05 and to this figure adding type score.

A Study of Grading, crisscrossing, and rotational crossing as breeding systems for commercial beef production. The objectives of this study are (1) To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for commercial beef production. (2) To study heterotic effects in crosses between Angus and Polled Hereford breeds as compared to heterosis in crosses between these breeds and Santa Gertrudis a breed based partially on a Brahman foundation. (3) To study the comparative value of the Santa Gertrudis breed with the Angus and Polled Hereford breeds.

The following experimental cow herds have been established with heifers from animals raised at the Prison Farm according to the following schedule:

| Breeding Systems | Breeding Herds | Year born (added as 2 yr olds) 1954 | 1955 | 1956 | 1957 | Total |
|---|---|---|---|---|---|---|
| Grading | Grade Angus | 14 | 11 | 7 | 8 | 40 |
| | Grade Polled Hereford | 14 | 11 | 7 | 8 | 40 |
| | Grade Santa Gertrudis | 9 | 17 | 7 | 8 | 41 |
| Crisscrossing | Angus x Polled Hereford | 14 | 11 | 8 | 8 | 41 |
| | Angus x Santa Gertrudis | 6 | 5 | 10 | 19 | 40 |
| | Polled Hereford x Santa Gertrudis | 9 | 18 | 5 | 8 | 40 |
| Rotational Crossing | Angus x Polled Hereford x Santa Gertrudis | 14 | 16 | 13 | 13 | 60 |

Data compiled so far pertains to records of calves born in 1957 from cows born in 1954. These were as follows:

| | Grade Angus | Grade Hereford | Grade Santa Gertrudis | AxH | AxSG | HxSG | AxHx SG |
|---|---|---|---|---|---|---|---|
| No. cows exposed | 14 | 14 | 9 | 14 | 6 | 9 | 14 |
| No. calves born | 7 | 10 | 8 | 13 | 4 | 9 | 11 |
| No. calves weaned | 6 | 10 | 7 | 12 | 4 | 9 | 11 |
| Av. birth wt., lbs. | 62 | 65 | 69 | 68 | 64 | 64 | 68 |
| Av. 210 day wt., lbs. | 351 | 325 | 450 | 387 | 411 | 451 | 406 |
| Av. slaughter grade* | 8.3 | 7.0 | 8.5 | 8.3 | 7.9 | 9.0 | 8.9 |
| Av. feeder grade* | 10.7 | 9.4 | 8.1 | 10.1 | 8.3 | 8.6 | 9.4 |

* According to S-10 Form.

Selection of beef cattle for single items of importance in profitable beef production. Objectives of this study are (1) to obtain preliminary information on the relative effectiveness of selecting for a single character and (2) to observe trends in characters for which no selection is made when selection is for a single character. Four herds of 50 grade Polled Hereford breeding females each are being established at the Georgia State Prison.

Selection criteria for three of these herds will be (1) weaning weight, (2) rate of postweaning gain and (3) visual appraisal or score. The fourth herd will be an average herd in reference to selection for these three characters.

Twenty-five females of breeding age were assigned to these herds for spring breeding, 1957. The herds should be completely established by 1960. Sires for the various herds are being selected from the Polled Hereford herd at Tifton.

Louisiana Report, S-10 Technical Committee, 1958

by

R. A. Damon, Jr.

The breeding program at this station is primarily the crossbreeding study that was started in 1952. The first phase of this project has been completed and several publications are planned to report the results. The second phase of this work, a backcrossing program, is underway and the first crop of calves was produced this spring.

The investigations of dwarfism in beef cattle, involving Hereford, Angus, Shorthorn, Brahman and Sindhi cattle which were being conducted by this station have been dropped. A study to determine the accuracy of evaluating the gaining potential of beef cattle prior to weaning which was scheduled to be initiated at this time has had to be indefinitely postponed. The project concerned with the investigation of the inheritance and effects of "double-muscled" condition in beef cattle is continuing with considerable information being produced. These data will be analyzed and published as soon as possible.

The results of five years crossbreeding work are presented in the following pages for several of the traits under study.

Adjusted 180-day Weights

| Breed of Dam | Av. Adj. 180-day Weights | Breed of Sire | Av. Adj. 180-day Weights | Breed of Group | Av. Adj. 180-day Weights |
|---|---|---|---|---|---|
| Brangus | 442.7 lbs. | Charolaise | 448.1 lbs. | Char. x Bra. | 466.9 lbs. |
| Brahman | 425.0 " | Hereford | 436.6 " | Char. x Bran. | 466.5 " |
| Angus | 410.8 " | Shorthorn | 417.0 " | Her. x Bran. | 465.0 " |
| Hereford | 404.2 " | Brahman | 416.2 " | Her. x Bra. | 455.8 " |
| | | Brangus | 413.2 " | Sh. x Bra. | 449.6 " |
| | | Angus | 392.8 " | Char. x An. | 440.8 " |
| | | | | Bra. x Bran. | 438.5 " |
| | | | | Sh. x Bran. | 436.3 " |
| | | | | Brangus | 433.4 " |
| | | | | Bra, x An. | 431.3 " |
| | | | | Bra. x Her. | 420.1 " |
| | | | | Char. x Her. | 418.4 " |
| | | | | An. x Bran. | 416.6 " |
| | | | | Hereford | 415.1 " |
| | | | | Her. x An. | 410.7 " |
| | | | | Bran. x An. | 406.9 " |
| | | | | An. x Bra. | 402.0 " |
| Total number of calves = 597 | | | | Bran. x Her. | 401.8 " |
| Average 180-day weight = 420.7 lbs. | | | | Bran. x Bra. | 400.8 " |
| | | | | Sh. x Her. | 391.7 " |
| | | | | Sh. x An. | 390.3 " |
| | | | | Angus | 384.8 " |
| | | | | Brahman | 374.9 " |
| | | | | An. x Her. | 367.9 " |

## Slaughter Calf Grades

| Breed of Dam | Average Slaughter Calf Grade | Breed of Sire | Average Slaughter Calf Grade | Breed of Group | Average Slaughter Calf Grade |
|---|---|---|---|---|---|
| Brangus | 12.23 | Hereford | 12.86 | Her. x Bran. | 13.47 |
| Brahman | 12.04 | Brahman | 12.10 | Her. x Bra. | 12.82 |
| Angus | 11.93 | Shorthorn | 12.07 | Sh. x Bra. | 12.78 |
| Hereford | 11.48 | Angus | 11.70 | Bra. x An. | 12.71 |
| | | Charolaise | 11.68 | Hereford | 12.65 |
| | | Brangus | 11.11 | Bra. x Bran. | 12.61 |
| | | | | Her. x An. | 12.50 |
| | | | | Char. x Bra. | 12.49 |
| | | | | Sh. x Bran. | 12.19 |
| | | | | An. x Bran. | 12.07 |
| | | | | An. x Bra. | 11.93 |
| | | | | Bra. x Her. | 11.85 |
| | | | | Angus | 11.83 |
| | | | | Sh. x An. | 11.83 |
| | | | | Char. x An. | 11.66 |
| | | | | Char. x Bran. | 11.57 |
| | | | | Sh. x Her. | 11.50 |
| | | | | Brangus | 11.49 |
| Total number of calves | = 597 | | | Brahman | 11.26 |
| Av. slaughter calf grade | = 11.92 | | | Bran. x An. | 11.05 |
| | | | | Char. x Her. | 10.99 |
| | | | | Bran. x Bra. | 10.98 |
| | | | | An. x Her. | 10.98 |
| | | | | Bran. x Her. | 10.91 |

Slaughter Calf Grades: 17 - 15, prime; 14 - 12, choice; 11 - 9, good; 8 - 6 commercial; 5 - 3, utility.

Rate of Gain on Feed

| Breed of Dam | Rate of Gain on Feed | Breed of Sire | Rate of Gain on Feed | Breed of Group | Rate of Gain on Feed |
|---|---|---|---|---|---|
| Hereford | 1.93 | Shorthorn | 1.82 | Bra. x Her. | 2.03 |
| Angus | 1.79 | Charolaise | 1.79 | Char x Her | 2.01 |
| Brangus | 1.64 | Hereford | 1.75 | Sh x Her | 1.99 |
| Brahman | 1.58 | Angus | 1.73 | Bra x An | 1.96 |
| | | Brahman | 1.67 | Char x An | 1.94 |
| | | Brangus | 1.65 | Bran x Her | 1.91 |
| | | | | Hereford | 1.83 |
| | | | | Her x Bra | 1.81 |
| | | | | Sh x An | 1.80 |
| | | | | Sh x Bran | 1.79 |
| | | | | An x Her | 1.79 |
| | | | | Angus | 1.74 |
| | | | | An x Bra | 1.72 |
| | | | | Char x Bran | 1.70 |
| | | | | Sh x Bra | 1.69 |
| | | | | Her x An | 1.68 |
| | | | | An x Bran | 1.67 |
| Total number of steers | = 275 | | | Her x Bran | 1.66 |
| Av rate of gain on feed | = 1.74 lbs | | | Bran x An | 1.60 |
| | | | | Brangus | 1.56 |
| | | | | Char x Bra | 1.53 |
| | | | | Bran x Bra | 1.52 |
| | | | | Bra x Bran | 1.49 |
| | | | | Brahman | 1.21 |

## Slaughter Grades

| Breed of Dam | Average Slaughter Grade | Breed of Sire | Average Slaughter Grade | Breed of Group | Average Slaughter Grade |
|---|---|---|---|---|---|
| Hereford | 11.08 | Hereford | 11.41 | Sh x Her | 11.77 |
| Angus | 10.81 | Shorthorn | 11.38 | Bra x An | 11.56 |
| Brahman | 10.29 | Angus | 10.64 | Sh x Bran | 11.50 |
| Brangus | 10.29 | Brahman | 10.52 | Sh x Bra | 11.49 |
| | | Charolaise | 10.07 | Her x An | 11.49 |
| | | Brangus | 9.71 | Bra x Her | 11.45 |
| | | | | Hereford | 11.43 |
| | | | | Her x Bra | 11.39 |
| | | | | Char x An | 10.99 |
| | | | | Angus | 10.81 |
| | | | | An x Her | 10.78 |
| | | | | Sh x An | 10.73 |
| | | | | Bran x Her | 10.68 |
| | | | | An x Bra | 10.65 |
| | | | | Char x Her | 10.37 |
| | | | | An x Bran | 10.32 |
| | | | | Bra x Bran | 9.83 |
| | | | | Bran x Bra | 9.76 |
| | | | | Char x Bran | 9.64 |
| | | | | Bran x An | 9.35 |
| Total number of steers | = 275 | | | Char x Bra | 9.26 |
| Av. slaughter grade | = 10.62 | | | Brahman | 9.22 |
| | | | | Brangus | 9.06 |

Slaugher Grades: 17 - 15, prime; 14 - 12, choice; 11-9, good; 8 - 6, standard; 5 - 3, utility.

Carcass Grades

| Breed of Dam | Average Carcass Grade | Breed of Sire | Average Carcass Grade | Breed of Group | Average Carcass Grade |
|---|---|---|---|---|---|
| Angus | 11.33 | Shorthorn | 11.53 | Sh x Bran | 12.25 |
| Hereford | 10.78 | Hereford | 11.04 | Sh x An | 11.94 |
| Brangus | 10.07 | Angus | 10.98 | Bra x An | 11.64 |
| Brahman | 9.50 | Brahman | 9.81 | Angus | 11.55 |
| | | Brangus | 9.78 | Her x An | 11.53 |
| | | Charolaise | 9.36 | Sh x Her | 11.50 |
| | | | | Hereford | 11.33 |
| | | | | Her x Bra | 11.10 |
| | | | | An x Bran | 11.06 |
| | | | | An x Her | 10.97 |
| | | | | Bran x An | 10.82 |
| | | | | Char x An | 10.51 |
| | | | | Bra x Her | 10.46 |
| | | | | Sh x Bra | 10.40 |
| | | | | An x Bra | 10.36 |
| | | | | Her x Bran | 10.22 |
| | | | | Char x Her | 10.21 |
| Total number of steers | | = 275 | | Bran x Her | 10.15 |
| Av. carcass grade | | = 10.42 | | Bran x Bra | 9.23 |
| | | | | Bra x Bran | 9.21 |
| | | | | Brangus | 8.92 |
| | | | | Char x Bran | 8.73 |
| | | | | Char x Bra | 7.97 |
| | | | | Brahman | 7.95 |

Carcass Grades: 17 - 15, prime; 14 - 12, choice; 11 - 9, good; 8 - 6, standard; 5 - 3, utility.

Weight Per Day of Age

| Breed of Dam | Weight per Day of age | Breed of Sire | Weight per day of age | Breed of Group | Weight per day of age |
|---|---|---|---|---|---|
| Brangus | 1.81 | Charolaise | 1.86 | Bra x An | 1.93 |
| Hereford | 1.78 | Shorthorn | 1.80 | Bra x Her | 1.90 |
| Angus | 1.76 | Brahman | 1.80 | Char x Her | 1.90 |
| Brahman | 1.75 | Hereford | 1.79 | Her x Bra | 1.89 |
| | | Brangus | 1.70 | Sh x Bran | 1.89 |
| | | Angus | 1.70 | Char x An | 1.87 |
| | | | | Sh x Bra | 1.87 |
| | | | | Her x Bran | 1.86 |
| | | | | Char x Bran | 1.86 |
| | | | | Bran x Her | 1.85 |
| | | | | Char x Bra | 1.81 |
| | | | | Bra x Bran | 1.79 |
| | | | | An x Bran | 1.78 |
| | | | | An x Bra | 1.76 |
| | | | | Sh x Her | 1.74 |
| | | | | Hereford | 1.73 |
| | | | | Sh x An | 1.70 |
| | | | | Her x An | 1.70 |
| | | | | Brangus | 1.69 |
| | | | | Angus | 1.68 |
| Total number of steers | = 275 | | | Bran x An | 1.65 |
| Av. weight per day of age | = 1.77 | | | Bran x Bra | 1.63 |
| | | | | An x Her | 1.57 |
| | | | | Brahman | 1.55 |

Mississippi Report, S-10 Technical Committee, 1958
by
J. C. Taylor, C. E. Lindley, Bryan Baker, Jr. and B. G. Ruffin

Beef cattle breeding research in Mississippi is presently being carried out at the main station at Starkville, and on an area of land located at Prairie which consists of 2000 acres. This property is leased from the Federal Government. A grade herd of 350 cows consisting of Angus, Hereford, and Shorthorn breeding are being maintained on this property and are used in a study to determine the breeding worth of inbred and outbred bulls from various sources. The main objective being to compare the growth rate, carcass qualities and maternal abilities of the progenies of bulls selected from various sources as being potentially superior sires. At the same time it is desired to develop a high producing herd of cows by using the progeny of good producing bulls as replacement heifers.

Calves from 6 bull units representing 180 cows were dropped during the spring of 1957. The bulls used were two Hereford and one Angus from the Mississippi Station, one Angus from the Virginia Station, one Hereford from the Texas Station, and one Polled Hereford from the Georgia Station. The first five steers born in each bull unit were selected as tester steers making a total of 28 steers (four steers used from two of the bulls) which after a period of dry lot feeding were placed in a group on winter grazing consisting of oats and rye grass. The selection of heifer progeny from each bull unit was done by selecting the top half of the heifers from each of the six sires on the basis of an index which gave equal emphasis to gain from birth to weaning and grade at weaning. A total of 25 heifers were selected as replacements. These heifers were roughed through the winter and are at present being carried on pasture. The steers were removed from winter grazing June 6 and are presently being fattened on corn for slaughter in the fall. Data collected to date on the 1957 calf crop is presented in Table 1.

The bulls used in the 1957 breeding season were two Hereford from the Colorado Station (one from the Brae Arden and one from the Royal line), one Hereford from the California Rover line, one Polled Hereford from the Georgia Station, and one Hereford from the Mississippi Station. The calves from these matings were dropped during the spring of 1958 and data on them will be presented in the annual report.

Hereford bulls being used in the present (1958) breeding season consists of one from the California Rover line, two from the Colorado Station, (one from the Brae Arden and one from the Royal line) one from the Oklahoma large type line, one from the Mississippi Station, and one Montana Line 1 bull which has been used previously. The reason for using the Montana bull was in order that comparisons may be made of the Colorado, California and Montana lines in the same season. Angus bulls being used consist of one O. K. Quality bull from the Oklahoma Station, two Eileen-mere bulls from the Virginia Station, one bull from the Mississippi Station, and an Eileenmere 1100 bull owned co-operatively with a private breeder. One of the bulls from the Virginia Station is being used for the third consecutive breeding season. Three Shorthorn bulls are being used, two of which are from the Mississippi Station, and one from the Virginia Britomac Prince Command line. Bulls from sources other than the Mississippi Station that have been tested to date are as follows:

3 Montana line No. 1 Hereford bulls
3 Georgia Polled Hereford bulls
3 Texas high-gaining Hereford bulls
3 Virginia Eileenmere Angus bulls
2 Colorado Brae Arden Hereford bulls
2 Colorado Royal Hereford bulls
2 California Rover Hereford bulls
1 Oklahoma large type Hereford bull
1 Oklahoma O. K. Quality Angus bull
1 Virginia Britomac Prince Command Shorthorn bull

Data from the 1956 calf crop has been reported for both weaning and feed lot performance in the 1956 and 1957 annual reports. A more complete summary of the data is presented in Table 2 in order that comparisons may be made between weaning and feedlot performance. There was a spread of 39 pounds in weaning weight and 103 pounds at slaughter between the progeny of the different bulls. Excellent cooperation of the local packing plant has afforded the opportunity for the collection of the carcass data also shown in Table II. Small differences were noted in dressing percent; however, carcass grades ranged as much as two-thirds of grade. These differences were reflected in the marbling scores. Carcass length varied as much as 3.2 inches and area of the loin eye varied 0.6 of a square inch. Smaller differences were noted in width and length of the loin eye as well as in width of the fat rind.

The occurrence of heat has been observed in the replacement heifers at Prairie for a period from weaning through late summer. A summary of the data collected from the 1956 calf crop is presented in Table 3. Also shown in Table 3 is the data collected on the 1957 calf crop through June of this year. Spayed heifers that are receiving injections of stilbestrol and progesterone are being used to check heat in the heifers this year. In the previous year the heifers were driven into a group twice daily and observed for the occurrence of heat. With the exception of the Hereford, the heifers are coming into heat much earlier this year than last. The 1956 heifers started coming into heat during June with 42 percent first showing heat in July. No heat was observed in 15 percent of the 52 heifers. During the present year, 3 out of 42 heifers kept as replacements first came into heat during January. All of the Shorthorn heifers have been in heat as well as 10 of the 12 Angus, but only 5 out of the 20 Hereford heifers have been observed in heat. These data are being compiled to determine if early sexual activity as well as regularity of the heat period may be used to indicate reproductive performance in the mature animal.

The third annual beef bull performance test is scheduled to begin at State College this fall. Performance testing is being received with a great deal of enthusiasm among the breeders in Mississippi and the indications are that more bulls will be nominated for testing this year than in the previous two tests. A crowd of approximately 400 people attended the Beef Cattle field day and bull sale May 2. The 21 head of bulls sold for an average price of $550 and prices within each breed were fairly well in line with the index score which gave equal emphasis to lifetime gain and grade at the end of the test. The four Hereford bulls sold lined up exactly with the highest selling bull also having the highest index and on down to the lowest indexing bull bringing the least money. There were eight Angus bulls sold and the three top selling bulls were also the three highest indexing bulls.

Future plans for beef cattle breeding work in Mississippi are to continue the testing of bulls from as many sources as the present facilities will accommodate. Also the beef cattle herds at six of the branch stations which total 450 grade cows are planned to be used in a study designed to compare the performance of large, small, and intermediate type bulls with respect to gain and grade. A study is also being planned for 60 registered Hereford cows located at Hinds Junior College. The objective of the study will be the selection and breeding of a high-gaining line of Hereford cattle.

Lowered Fertility in the Bovine:

In the Mississippi Experiment Station System there are more than 1000 beef and dairy cows in the breeding herds and each year a number of these cows are replaced because they have poor reproductive performance. It is from these animals that the experimental animals for this study are drawn. The criteria that was set up for cows to be used in this study are: (1) the cow be open; (2) have a full mouth; (3) free of gross evidence of clinical abnormality or disease; and (4) must have been bred at least 4 times since last calf without apparent pregnancy or with a bull continuously for 6 months without becoming pregnant or failed to settle after 2 breeding seasons (3 months each). Each animal used in the study was blood tested for reproductive disease and the reproductive organs examined by rectal palpation upon being accepted for use in this study.

Daily checks for estrus were made twice daily and the condition of the reproductive tracts were followed by periodic rectal palpation. These cows were inseminated with high quality semen on the second estrus after entering the experimental area and if she fails to return into heat a pregnancy examination is made after 35-40 days and the cow slaughtered and the reproductive tract recovered for detail examination. If the cow returns to estrus she was rebred and slaughtered 3-4 days later and the reproductive tract examined for gross abnormalities and condition of the ova. Detail bacteriological studies of the reproductive tracts were made from swab samples of the vagina, cervix and uterus by direct microscopic and cultural techniques.

To date, 34 cows have been examined and because the project is still in its early phases, no definite conclusions can be drawn from the data collected. However, as is generally expected, a number of the cows previously diagnosed as sterile were pregnant at 35-40 days after breeding (18 percent of total cows). Another 23 percent had fertilized ova, 21 percent unfertilized ova or abnormal ova and no ova or embryo was recovered from 38 percent of the cows examined. The latter percentage is high because attempts were made to recover embryonic structures from 7-12 days after breeding and these attempts were unsatisfactory. Cases of cystic ovaries, occluded structures and hydrosalpinx were observed in addition to deviations from the normal length estrual cycles.

A large number of bacteria have been isolated from the vagina, cervix and uteri of the cows examined but to date no attempts have been made to draw any conclusions from these findings. It appears that many of the isolates are very common bacteria and perhaps may not contribute to infertility. It is interesting that no pathogenic organisms (vibrio and Brucella) have been isolated but on the other hand a number of fungi have been picked up in the uterus and in some of these cases histological examination revealed that these organisms were invading the uterine tissue.

This work will be continued another year without any major changes.

Table 1. Performance of Cow Herds. 1957 Calves. Prairie, Mississippi

| Line or group designation | Duke | Ky. | Va. | Bridwell | Texas | Georgia |
|---|---|---|---|---|---|---|
| Breed of sire & dam | Hereford | Angus | Angus | Hereford | Hereford | Hereford |
| No. cows bred | 30 | 30 | 30 | 30 | 30 | 30 |
| No. cows calving | 14 | 13 | 25 | 24 | 23 | 27 |
| No. calves raised | 14 | 12 | 19 | 21 | 19 | 26 |
| Av. birth date | 3/13 | 3/19 | 2/25 | 2/25 | 3/3 | 3/10 |
| Av. birth wt. (lbs) | | | | | | |
| Bulls | 67.0 | 68.6 | 64.2 | 73.8 | 76.3 | 74.1 |
| Heifers | 68.8 | 64.5 | 61.7 | 68.2 | 70.6 | 72.6 |
| Were calves creep fed | No | No | No | No | No | No |
| Av. weaning date all calves | 11/6 | 11/6 | 11/6 | 11/6 | 11/6 | 11/6 |
| Av. weaning wt. | | | | | | |
| Steers | 368.6 | 447.4 | 500.0 | 430.1 | 462.2 | 466.0 |
| Heifers | 404.0 | 377.5 | 457.0 | 429.1 | 427.6 | 428.2 |
| Av. weaning type score | | | | | | |
| Steers | 11.5 | 11.5 | 11.9 | 11.0 | 11.4 | 11.6 |
| Heifers | 11.9 | 9.9 | 11.8 | 11.2 | 11.1 | 11.0 |
| No. steers wintered | 4 | 4 | 5 | 5 | 5 | 5 |
| No. days fed in dry lot | 66 | 66 | 66 | 66 | 66 | 66 |
| No. days on winter grazing | 84 | 84 | 84 | 84 | 84 | 84 |
| Av. total gain in dry lot | 54 | 39 | 91 | 8 | 24 | 19 |
| Av. total gain on grazing | 114 | 100 | 78 | 139 | 109 | 130 |
| Av. daily gain for entire winter period | 1.12 | .93 | 1.13 | .98 | .89 | .99 |

Table II. Performance of Progeny of Five Bulls Used in the Mississippi Agricultural Experiment Station Herds at Prairie, Mississippi 1956 Calf Crop.

| Performance of Calves | Bulls | | | | |
|---|---|---|---|---|---|
| | Hereford Mont.558 | Hereford Ga. Poll T444 | Hereford Tex. 534 | Angus Va. T161 | Hereford Miss. En. 16 |
| No. cows bred | 30 | 30 | 30 | 21 | 28 |
| No. cows calving | 21 | 25 | 23 | 17 | 25 |
| No. calves raised | 20 | 24 | 22 | 15 | 25 |
| Av. birth date | 3/18 | 3/11 | 3/16 | 3/4 | 3/10 |
| Av. birth wt. (lbs) | | | | | |
| Bulls | 72.3 | 61.8 | 69.9 | 64.1 | 67.8 |
| Heifers | 72.8 | 63.0 | 62.4 | 49.8 | 64.2 |
| Av. weaning wt. * | | | | | |
| Steers | 439.9 | 419.5 | 421.0 | 410.5 | 415.6 |
| Heifers | 436.6 | 401.7 | 377.7 | 398.6 | 385.0 |
| Average | 438.2 | 410.6 | 399.4 | 404.6 | 400.3 |
| Av. weaning type score | | | | | |
| Steers | 10.2 | 11.3 | 10.4 | 11.6 | 11.2 |
| Heifers | 10.2 | 10.7 | 10.5 | 11.0 | 9.8 |
| **Feedlot Performance** | | | | | |
| No. steers fed | 4 | 5 | 4 | 5 | 5 |
| Days on feed | 153 | 153 | 153 | 153 | 153 |
| Av. daily gain on feed | 2.00 | 1.95 | 1.90 | 1.72 | 1.99 |
| Av. age at slaughter | 612 da. | 612 da. | 605 da. | 611 da. | 608 da. |
| Av. wt. at slaughter | 963.7 | 918.6 | 936.0 | 861.0 | 896.8 |
| **Carcass data** | | | | | |
| Av. carcass wt. | 550.0 | 520.0 | 523.2 | 487.8 | 501.8 |
| Av. dressing percent | 57.0 | 56.6 | 55.8 | 56.5 | 55.9 |
| Av. carcass grade | 9.0 | 9.6 | 8.0 | 10.0 | 9.0 |
| Marbling score ** | 5.0 | 4.2 | 1.7 | 5.8 | 3.2 |
| Carcass length | 46.8 | 45.3 | 45.3 | 43.6 | 45.7 |
| Area loin eye sq. in. | 9.90 | 9.30 | 9.80 | 9.54 | 9.73 |
| Width loin eye | 2.06 | 2.13 | 2.04 | 2.06 | 2.06 |
| Length loin eye | 5.8 | 5.2 | 5.6 | 5.4 | 5.4 |
| Width fat rind | .95 | .75 | .85 | 1.13 | .81 |
| **Rank of Bulls** | | | | | |
| Av. weaning wt. | 1 | 2 | 5 | 3 | 4 |
| Feedlot gain | 1 | 3 | 4 | 5 | 2 |

* Weaning wt. adjusted to average age of 205 days.

** Marbling score:

| | | | |
|---|---|---|---|
| 0,1,2 | no marbling | 9,10,11 | medium amount of marbling |
| 3,4,5 | trace of marbling | 12,13,14 | abundant marbling |
| 6,7,8 | slightly marbled | 15,16,17 | heavy amount of marbling |

Table III. Summary of Occurrence of First Estrus Following Weaning in Replacement Heifers

| | 1956-57 | | | | 1957-58 | | | |
|---|---|---|---|---|---|---|---|---|
| Av. Birth date | 2/23/56 | 3/15/56 | 3/8/56 | | 3/5/57 | 3/5/57 | 2/28/57 | |
| Breed | Angus | Hereford | Shorthorn | Total | Angus | Hereford | Shorthorn | Total |
| Nov. | | | | | | | | |
| Dec. | | | | | | | | |
| Jan. | | | | | | 1 (5) | 2 (17) | 3 (7) |
| Feb. | | | | | 1 (10) | | | 1 (2) |
| Mar. | | | | | | 1 (5) | 4 (33) | 5 (12) |
| Apr. | | | | | 2 (20) | | 1 (8) | 3 (7) |
| May | | | | | 4 (40) | 2 (10) | 5 (42) | 11 (26) |
| June | 1 (10) | 4 (13) | 2 (17) | 7 (13) | 1 (10) | 1 (5) | | 2 (5) |
| July | 5 (50) | 12 (40) | 5 (42) | 22 (42) | | | | |
| August | 3 (30) | 7 (23) | 1 (8) | 11 (21) | | | | |
| Sept. | | 3 (10) | 1 (8) | 4 (8) | | | | |
| Oct. | | | | | | | | |
| No. Heat Observed | 1 (10) | 4 (13) | 3 (25) | 8 (15) | 2 (20) | 15 (75) | 0 | 17 (40) |
| Total | 10 | 30 | 12 | 52 | 10 | 20 | 12 | 42 |

() indicates percent of the total.

North Carolina Station
Submitted by J. H. Gregory, June, 1958

The work at the North Carolina Agricultural Experiment Station has emphasized two major areas of work: (1) "The Improvement of Beef Cattle through Breeding Methods," and (2) "The Development of Beef Cattle Especially Adapted to the Coastal Plain Region of North Carolina."

The latter project has been discontinued due to the expiration of the lease for the range land, the low performance and vitality in the $F_2$ groups and the limited number from which to select. The Romo-Sinuano-Hereford group has been moved to a private farm in the Tidewater area of North Carolina.

As part of the research in "The Improvement of Beef Cattle through Breeding Methods," weights and body measurements are taken on all the purebred cattle at regular intervals. The purebred bulls and heifers are put on a post weaning gain test and progeny performance is obtained on selected gain tested bulls. Grade herds are used in sire evaluations to study reproductive characteristics and to evaluate progress made through selection.

In 1956 the Experiment Station in cooperation with the Extension Service established a production testing program with cooperating farmers. The program is designed to evaluate the productivity of sires and dams upon the basis of weight and grade of calf at or near weaning time. Weights and grades have been obtained on all calves since 1956. At present there are over 1500 calves in the production testing program.

In 1957 a group of dwarf carrier cows was assembled to be used in "Determining a Method for Detecting Dwarf-Carrier Cattle" and also are used in sire evaluation tests. The blood-sampling work for detecting dwarfism will be started this summer. One dwarf calf was sired by the bull used in 1957.

## Recent Research

A. Influence of age of dam and sex of calf upon six months weight of calf.

In recent research conducted at the North Carolina Experiment Station on the influence of age of dam and sex of calf as it affects the 182 day weight of the calf, shows there is a small difference due to sex in 3 year old cows and this difference increases with age of dam up to 9 years and then starts to decrease as shown in chart 1. A curvilinear regression analysis was used in determining the age of dam effects. The weight of calf increases with age of dam up to 9 years (chart 1) and then there is a general decrease. This age is older than that most often reported in literature.

B. A Study of the Relationship Between the Performance of Certain Bulls to the Performance of their Progeny.

In 1950 the North Carolina Experiment Station started a bull-testing program with the four or five top indexing bulls (based on rate of gain and grade for 168 day feeding period with 50% for rate of gain and 50% for grade) being used each year on grade herds of outlying stations.

Table 1 shows the correlation of traits of the bulls with traits of the offspring.

Table 1

| Traits of offspring | Traits of Bulls | |
|---|---|---|
| | 182 day wt. | 154 day feedlot gain |
| 182 day weight | .035 | .081 |
| 182 day grade | - .013 | - .018 |
| 18 month wt. steers | - .015 | .194 |
| 18 month grade steers | - .083 | .17 |
| 18 month wt. heifers | .15 | .058 |
| 18 month grade heifers | - .046 | .012 |

Table 2 shows estimate of heritabilities obtained.

Table 2

Estimate of Heritabilities

| Trait | No. Animals | Heritability |
|---|---|---|
| 182 day weight | 438 | .54 |
| 182 day grade | 438 | .23 |
| 18 month weight steers | 177 | .14 |
| 18 month grade steers | 166 | .0 |
| 18 month weight heifers | 153 | .14 |
| 18 month grade heifers | 124 | .0 |

Effect of Sex of Calf and Age of Dam on 182-day Weight.

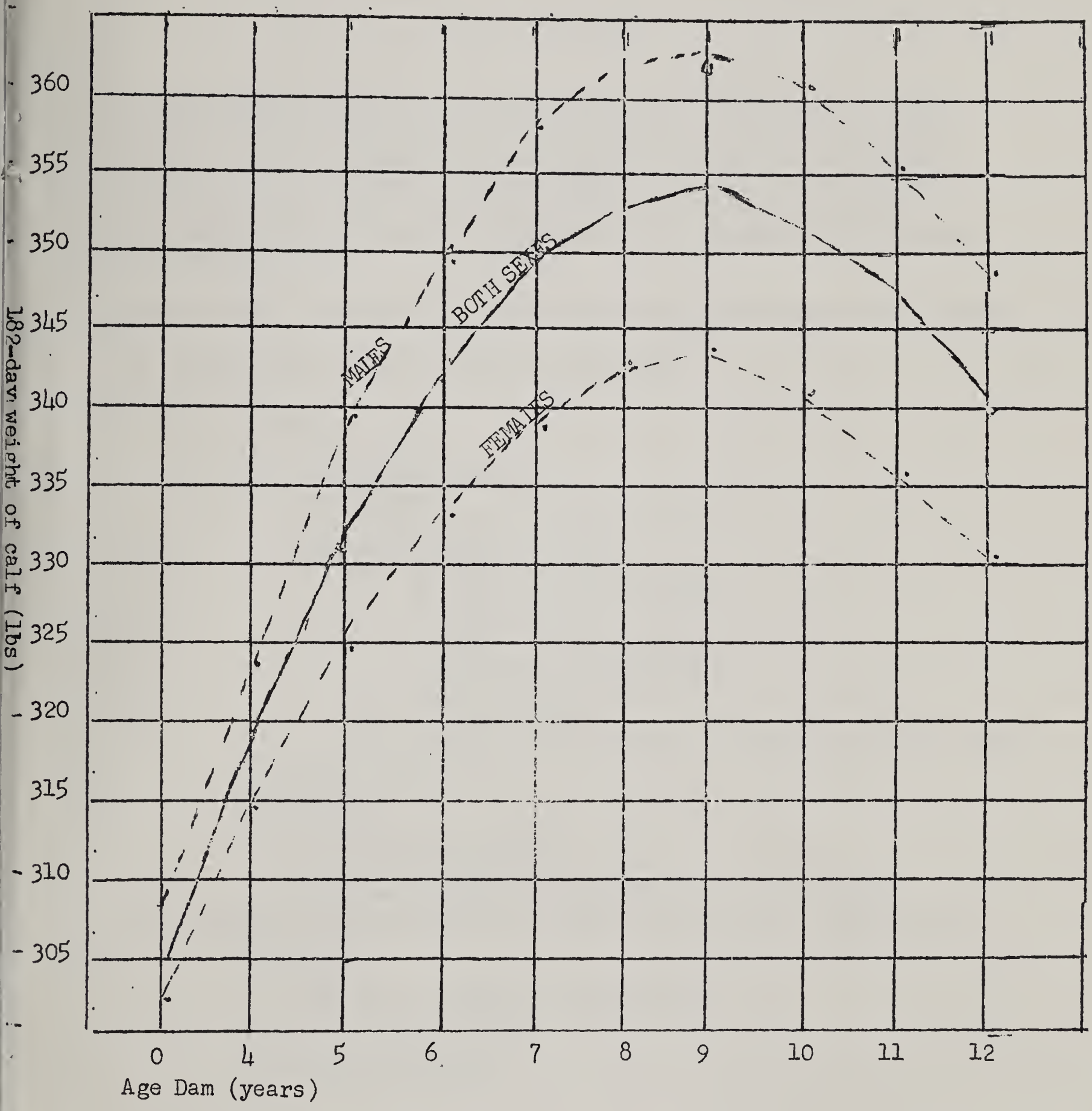


Chart 1.

# A REVIEW OF STUDIES CONDUCTED IN W-1 ON EFFICIENCY OF FEED UTILIZATION IN BEEF CATTLE

by C. E. Shelby

Considerable research on efficiency of feed utilization in beef cattle has been conducted in W-1. Since the literature on this subject is so voluminous, no attempt will be made to completely review it, but instead, a broad outline of some of the factors affecting this trait will be presented. A bibliography of 87 scientific papers from W-1 dealing with some aspects of this problem is included.

## SOME FACTORS AFFECTING EFFICIENCY OF FEED UTILIZATION IN BEEF CATTLE

A. Environment prior to the feed-lot test
    1. Prenatal
        a. Birth weight
    2. Pre-weaning and weaning
        a. Body weights
            (1) Genetic constitution of calf
            (2) Availability of feed
                (a) Milking ability of dam
                    1. Genetic constitution
                    2. Age of cow
                    3. Weight and condition
                    4. Availability of feed
                (b) Creep feeding
                (c) Quality and quantity of pasture or other forage
        b. Body measurements
        c. Scores
    3. Post-weaning
        a. Availability of feed
        b. Length of period before test
        c. Adjustment period on preliminary or test ration
B. Physical characteristics of animals at onset and end of test
    1. Condition
        a. Scores
        b. Chemical or physical measurements
    2. Weight on and off test
        a. Compensatory gain
    3. Age on and off test
    4. Sex
        a. Hormones
    5. Line
    6. Breed
    7. Crossbreds
C. Environmental factors
    1. Year
    2. Herd

D. Procedure and conduct of test
   1. Type of test
      a. Time constant
      b. Weight constant
      c. Condition constant
   2. Type of ration and method of feeding
      a. Rate or level of feeding
      b. Composition of the concentrate mixture
      c. Kind and quality of roughage
      d. Ratio of concentrate to roughage
      e. Digestion coefficients
      f. Feed additives
      g. Hand- or self-fed
      h. Pelleted or nonpelleted ration
      i. Management on test
         (1) Number and length of daily feeding periods
         (2) Length of confinement in the stall or lot
         (3) Amount and type of exercise
         (4) Availability of water
      j. Typical management procedures and rations
   3. Length of feeding period
   4. Digestive disturbances
      a. Bloat
   5. Methods of weighing
      a. Fill at beginning and end of test period
         (1) Multiple weights
      b. Time of weighing
      c. Frequency of weighing

E. Measurement of the efficiency of feed utilization
   1. Method of measurement
      a. Total feed required for 100 pounds of gain
         (1) Pounds of concentrate plus pounds of roughage
         (2) Total pounds of concentrate and roughage
      b. TDN required for 100 pounds of gain
      c. Pounds of gain from each 100 pounds of total digestible nutrients
   2. Condition of experimental animals throughout the test
   3. Composition of gain
      a. Protein, fat, or water
         (1) Energy requirement for storage
   4. Compensatory growth
   5. Physiological differences between animals

F. Relationship to other traits
   1. Average daily gain
   2. Body weight
   3. Condition and conformation scores
   4. Body measurements
   5. Blood and urine constituents
   6. Carcass traits

G. Effectiveness of selection
   1. Heritability
   2. Repeatability
   3. Genetic, phenotypic and environmental correlations

4. Correction factors
5. Selection studies

H. Future studies

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